THE

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ELECTRICAL REVIEW.

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TRADE WITH CANADA.

FOR some years, as our readers know, we have devoted much attention to the subject of British trade with Canada, and we have repeatedly published articles pointing out the immense possibilities, both present and future, of this outlet for our manufacturers, as well as letters from correspondents possessed of special knowledge of the conditions obtaining in this market. Briefly recapitulating, we may say that the principal facts thus demonstrated have been the following :

Canada is undoubtedly advancing with rapid strides ; her natural resources are almost unlimited, her population is increasing in a high ratio, and she offers a magnificent field for engineering enterprise in connection with the development of her abundant water-power, the provision of transit facilities, and the establishment of industries. Moreover, her people are alert and up-to-date in their ideas, and are eager to take advantage of the latest improvements in machinery and plant, while the use of electricity is practically universal. The Dominion is separated from the United States over a length of more than 2,000 miles by a merely imaginary boundary line, yet she is willing and anxious to trade over-seas with this country, and even offers us a preferential tariff—the recent rejection of the proposed reciprocity treaty is fresh in memory. But our manufacturers, for various reasons, have not hitherto availed themselves of their opportunities in Canada to any considerable extent ; a certain amount of business is carried on directly, and many firms have agencies there, but neither method has more than scratched the surface of the soil. First-hand trading is possible only in certain lines, and has little tendency to develop beyond its existing boundaries.

Agencies are notoriously unsatisfactory ; the customer feels that he is dealing with an unsubstantial shadow, the agent has little inducement to push British wares rather than those of American firms which he may also represent, and the manufacturer never gets into touch with local conditions and requirements. On the other hand, the establishment of a branch office, in charge of a representative vested with the requisite authority to treat with clients at his own discretion, involves an outlay which cannot be contemplated without the strongest grounds for anticipating a large demand, and to be effective, necessitates the organisation of a large number of sub-offices, to cover so enormous an area as that of the Dominion. As regards the quality of our manufactures, it is admitted that they are at least as good as those of the United States—often better—and if the demand for them were sufficient, our manufacturers would willingly modify their designs to satisfy local conditions and national predilections. In spite of the seeming nearness of the United States, we are little, if at all, handicapped by distance, either in time of delivery or in cost of freight, for our goods are largely water-borne, even to the heart of Canada, and can actually be delivered at Vancouver more

cheaply than goods from the Eastern States. Further, in point of cost of production we are undoubtedly in a better position than our rivals, without considering the benefit of preference both by tariff and by national sentiment, which must not be ignored. We have against us the efficiency of the American salesmen who abound in Canada, and who, being familiar with the customs and modes of thought of the country, are in a better position than Englishmen to push their wares, while their local knowledge enables them, time and again, to offer incredible guarantees with the certainty that their professions will never be put to the test, and to grant long credit where a British firm would feel compelled to stipulate for cash with order. Again, American practice has largely imposed itself upon Canadians—many of whom have been trained, more or less, in American Institutions—and their apparatus are, therefore, more readily adapted to Canadian needs than ours. Lastly, there undoubtedly exists in Canada an impression, which loses nothing from American efforts, that this country lags behind the times, and cannot produce the newest and most modern goods. Add to this that, owing to the demand for engineers in Canada, many men in highly responsible positions have had no technical training to speak of, and are very much in the hands of clever and voluble American selling agents. These are the conditions, and it will be seen, on summing them up, that in many respects they are in our favour; while, where the contrary appears to be the case, it is largely due to misconception, or ignorance of our capabilities, to the lack of intimate communication between manufacturer and purchaser, and to the want of a suitable organisation to bring our products directly before the Canadian people. There are other factors—such as the difficulty of obtaining spare parts at short notice, the tendency of manufacturers to give priority of urgency to home orders, and so on—which need not be dwelt upon at the moment.

All these points, and other, we have dealt with from time to time, and we have consistently urged our manufacturers to tackle the question seriously, before it is too late. It is, therefore, with sincere pleasure that we have learnt of the formation of an organisation designed to promote British engineering trade with Canada, which appears to be admirably adapted to cope with the difficulties we have mentioned, and to be worthy of cordial support. The scheme originated with Mr. Leonard Andrews, who is already well known in electrical engineering circles, and played a prominent part in the establishment of the manufacture of large gas engines in this country. Mr. Andrews's attention was drawn to the Canadian market two years ago—we were then publishing an extended serial examining the various promising markets under the title "Notes on Trade Abroad"—and as the result of a tour in that country he was so deeply impressed with the scope it offered for trade with Great Britain, that he has since devoted most of his time to the elaboration of a plan to surmount the difficulties of the case. During that visit he made the acquaintance of Mr. W. A. Martin, assistant manager of the Toronto Electric Light Co., one of the largest undertakings of its kind, and last year he made a second tour through Canada in company with Mr. Martin, with the result that his first impression deepened into conviction. Negotiations with British manufacturers showed that the latter would gladly avail themselves of the facilities for trade provided by the scheme, which is roughly out-lined below.

A company is about to be formed, with sufficient capital to command the confidence both of British manufacturers and of Canadian bankers and purchasers; offices will be established in the chief centres of the Dominion, each in the charge of a director of the company, who will deal directly with the purchaser and accept full responsibility for the prompt delivery and fulfilment of guarantees of all goods supplied. A staff of experts will be maintained in Canada, available for consultation wherever required, and a larger staff of local representatives will be distributed throughout the country, to act as an intelligence department and to seek business. Thus, the customer will be sought out, provided with expert advice — often very necessary — and enabled to negotiate directly across the table with one of the principals of the company, vested with full authority to enter into contracts (in conjunction, of course, with the managing director) for the supply of the goods. On this side there will also be a complete organisation to deal with the manufacturers, and equally armed with full authority; being in effect the actual purchaser, the company will be in a position to keep deliveries up to the mark, to demand the fulfilment of guarantees, and, by virtue of its financial stability, to obtain a reasonable allowance of credit. The company will be able to make itself fully conversant with local conditions, and where these necessitate modifications in our standard designs, to explain the necessity to the manufacturers, who are perfectly willing to meet the requirements where good cause is shown. A number of our most important engineering firms have already given their adhesion to the scheme, which provides precisely what they need to enable them to cater for this huge market on efficient and economical lines; but the company is not tied to these firms only. In the first instance, at any rate, engineering work alone will be handled by the company, but later other departments may be formed; there is abundant scope in this field to occupy all its attention for some years to come. The constitution of the undertaking has been framed upon conservative lines, with a view to commencing with a moderate capital, and increasing it when the results of its operations are manifest and better terms can be commanded. We shall return to the subject when details are available; in the meantime we commend the matter to our readers as being well worthy of their close attention, and we cordially welcome a venture, the success of which would be of the greatest benefit to the British and Canadian peoples.

The Restrictive Covenant.

It is often necessary for men who are taking persons into their service, to consider the propriety of introducing what is known as a restrictive covenant. Such a covenant is necessary to prevent a servant making undue and improper use of the knowledge which he acquires of his employers, customers, and concerns. It is, however, part of the law of England that a covenant in restraint of trade is illegal. How, then, do the Courts ever lend their aid to enforce restrictive covenants? It has been held that a covenant which is reasonably necessary for the protection of the employer will be upheld; and the numerous cases which have been decided in relation to these covenants generally turn upon the question whether they are reasonable or not. For instance, a covenant whereby a man undertook not to carry on the trade of a "wireman" anywhere for the rest of his natural life, would clearly be void as being unreasonable. But an agreement not to undertake employment as traveller for any firm dealing in electric fittings within a mile of St. Paul's, would be upheld as

being reasonably necessary for the protection of the late employer, whose customers might be induced to leave him at the instigation of his late employé. A case which was heard recently in the King's Bench Division shows that a covenant must be certain as well as reasonable. The facts were that a man entered the employment of the Provident Clothing and Supply Co. upon the terms that he would not "within three years after the termination of his engagement . . . . be in the employ of any firm . . . . carrying on a similar business . . . . within 25 miles of London where the company carry on business." The employé having in fact canvassed for another firm within 25 miles from London, the company sought an injunction to restrain him. A County Court judge granted an injunction; but the Divisional Court, on appeal, discharged the injunction on the ground that the covenant was too vague. Mr. Justice Pickford said: "The words 'within 25 miles of London where the company carry on business,' were words to which the Court could attach no intelligible meaning, as the company had about 15 shops in different parts of London." This case draws attention to the importance of having the terms of a covenant of this kind accurately and clearly stated. No doubt this particular clause was drafted when the company had only one place of business in London. In that case it would have afforded the company protection.

Concentration in Germany.

A FURTHER step in connection with the process of concentration in the German electrical industry is now taking place by the establishment of a community of interests between the Siemens-Schuckert Works and the Bergmann Electricity Works Co. To some extent the scheme represents a countermove to the association of the A.E.G. with the Felten & Guilleaume Co., which took place some time ago. The undertaking of the Bergmann Co. has been developed beyond its financial resources, and the question of the future of the company has for some time past been under the consideration of the directors, and of the banks connected both with the company and the Siemens-Schuckert group. It has now been agreed to raise the share capital of the Bergmann Co. from £1,450,000 to £2,600,000 by the issue of new shares of £1,150,000. Of these the Deutsche Bank, the Disconto Gesellschaft, the Schaffhausen Bank Verein, and other banks, will take over £725,000 and offer the shares to existing proprietors at the price of 110 per cent., whilst out of the balance the Siemens-Schuckert Works will subscribe for £400,000 at the same price. The Siemens & Halske Co., which is part proprietor of the Siemens-Schuckert Works, is making an issue of £1,000,000 in bonds, partly for the purpose of participating in the Bergmann Co. It is significant that the Siemens-Schuckert Co., as a consequence of newspaper reports of the proposed formation of a monopoly in the electrical industry, recently published a statement submitting that both that company and the Siemens & Halske Co. had always expressed themselves against efforts to constitute an electrical trust, as the creation of such a combination would deprive the industry of the technical progress which is requisite if the industry is to continue to maintain its leading position in the world. It is contended that an electrical monopoly could never assume a permanent form, as the industry does not control the necessary raw materials, and competition could, therefore, be revived at any time. The Siemens group would, consequently, greatly regret the disappearance of the Bergmann Co. as an independent undertaking, and it has therefore been decided to comply with the request to co-operate in the maintenance of the latter. The amount of the financial interest taken will not give the Siemens-Schuckert group a dominating vote in the affairs of the Bergmann Co., and an amalgamation of the interests of both companies is, therefore, out of the question. On the other hand, some of the German newspapers contend that this new association will really mean an abatement, if not a cessation, of competition by the Bergmann Co., and that there are now left only two groups, which frequently join hands in the carrying-out of large enterprises.

THE CAPACITY OF SMALL AIR CONDENSERS.

By CHAS. E. HAY.

IN calibrating small air condensers recently it was observed that the capacity appeared to be different when the condenser was reversed in the circuit. The same phenomenon presented itself some considerable time ago when measuring very small inductances with alternating current at a frequency of 2,000 periods per second by means of resistances and an air condenser. The phenomenon was not looked into then owing to more urgent work, and to the fact that

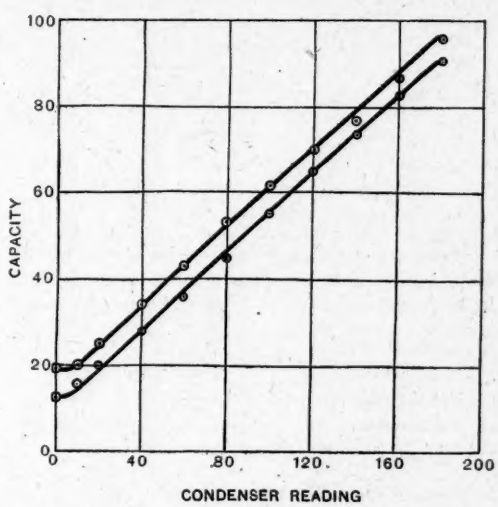


FIG. 1

when the air condenser was joined up in one particular way the inductance measurements agreed with the calculated results to one part in one thousand, which was quite close enough for the purpose in hand. On the phenomenon again appearing, very careful measurements were made by direct E.M.F. of about 1,500 volts and a ballistic galvanometer. The results

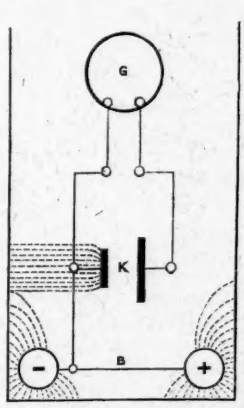


FIG. 2 (*a*).

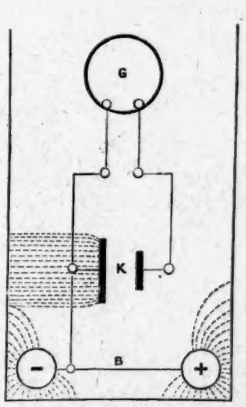


FIG. 2 (*b*).

of these measurements are shown in fig. 1. One of the curves represents the capacity when the air condenser was joined up in one direction, and the other when the connections to the air condenser were reversed. Fig. 2 shows the electrical connections of the circuit when the measurements were made, that is, one pole of the battery was kept joined to one plate of the condenser when the discharge was passed through the galvanometer, as is usually the case when an ordinary discharge-key is used. Fig. 2 also represents approximately the electrostatic field when the condenser was discharged through the galvanometer. For convenience and clearness, the potentials of the battery are shown as being concentrated at the ends of the battery connections, and the capacity of

the other parts of the circuit as being entirely located in the condenser, the leads and galvanometer being supposed not to have any capacity to earth. The condenser is shown as having plates of unequal area so as to represent unequal capacities to earth, as it is only in this type of air condenser that the phenomenon appeared. In fig. 2 (*a*) the smaller plate of the condenser is kept joined to the negative pole of the battery when the condenser is discharged through the galvanometer, and the electrostatic field depicted represents approximately the state of the field after the discharge has taken place. Of course, the larger plate also becomes charged negatively in this condition, but this is not shown. The electrostatic fields which existed between the plates of the condenser and the larger plate and earth before the condenser was joined to the galvanometer, have disappeared, sending through the galvanometer a quantity of electricity which is proportional to the capacity between the condenser plates and the capacity between the larger plate and earth. Reversing the battery will obviously not affect the quantity of electricity passing through the galvanometer, but only the direction of its flow. In fig. 2 (*b*) the larger plate is kept joined to the negative pole of the battery; the electrostatic fields between the plates of the condenser and between the smaller plate and earth have, in this case, disappeared, sending a smaller quantity of electricity through the galvanometer, and hence indicating a less capacity than before.

It is clear, therefore, that the difference in the capacity of the condenser, depending upon the way it is joined up, is due to the fact that one set of plates had a greater capacity to earth than the other set.

In all the small air condensers tried this phenomenon appeared. It was difficult to observe it with direct E.M.F. in some cases, as the difference in the capacity to earth of the two sets of plates was small; but with alternating E.M.F. at a frequency of 2,000 periods per second it was easily observed in all cases. The practice of screening small air condensers by enclosing the whole condenser in a metal receptacle joined to one set of the plates increases the difference in the capacity of the condenser very markedly. The experiments show that in the design of small air condensers, especially for high-frequency work, whether screened or unscreened, the capacity to earth of each set of plates should be equal.

MOTOR-GENERATORS FOR CINEMATOGRAPH SUPPLIES.

[BY A CONSUMER'S ENGINEER.]

In these days, when almost every town which can lay claim to be termed a town has its picture house or houses, it is interesting, from an electrical engineer's, as well as a company promoter's point of view, to know what proportion the cost of electrical energy for the cinematograph lantern bears to the total cost of running the picture house. It will be found that the bill for electricity is an extremely heavy item of expenditure, no matter what the method of utilising the energy may be, and much attention should therefore be directed to the apparatus in order to economise the current as much as possible.

Where a supply of electricity is given by a supply authority at a pressure exceeding 100 volts at the terminals, it is common practice to feed the current for the arc through a number of resistance coils, thereby limiting the current to that value necessary for the particular intensity of light required for the lantern lens. This method is simplicity itself, and naturally commends itself to the average theatre electrician whose aspirations tend more towards reducing his daily tasks than working his apparatus more economically.

But when it is pointed out that the efficiency of this method may be as low as 20 per cent. on a 250-volt circuit, the necessity for providing a more efficient arrangement becomes apparent to the proprietors of the theatre; and although the installation of a motor-generator may involve additional capital expenditure, the consequent saving in the electricity consumption will, in most cases, be found to defray the extra expenditure in a few months' time, depending on the voltage to which the arc has previously been connected.

Assuming that, in a cinematograph theatre open from 6 p.m. to 11 p.m. on six evenings per week, the arc takes an average current of 30 amperes, and that the supply voltage is 250 volts, the monthly account for electricity at 3d. per unit will be £11 5s. Fully three-fourths of the energy represented by this sum has been expended in heating the resistance coils connected in series with the arc, the remaining one-quarter embodying the energy actually utilised in the lantern.

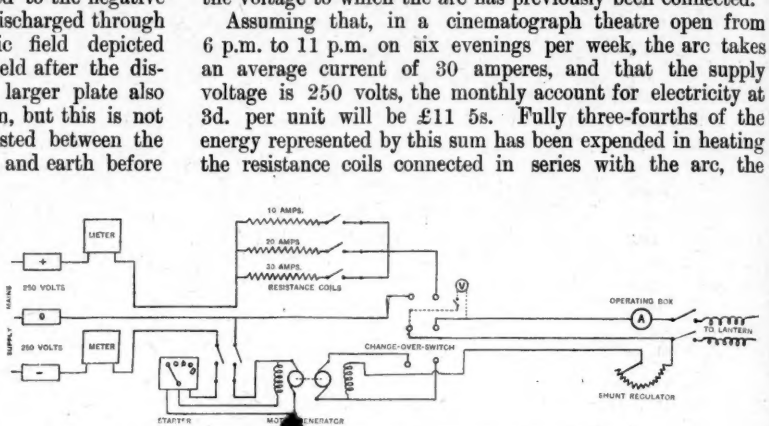


DIAGRAM OF CONNECTIONS FOR CINEMATOGRAPH SUPPLY.

If a motor-generator be employed, the efficiency of the system may reach as high as 80 per cent., and, assuming this efficiency, the monthly bill in the foregoing example would then amount to about £3 5s.—a saving of approximately £8 each month. Some supply companies and municipal undertakings, while they do not grant special rates for cinematographs, will, nevertheless, allow the energy consumed by motor-generators to be charged at power rates. A further economy may be brought about if this concession be obtained.

A number of manufacturing firms have placed motor-generators for cinematograph purposes on the market, at prices ranging from £50 upwards, and these can be constructed with their motors wound for any supply voltage, and the generator machines designed to deliver current for the arc up to, say, 70 amperes at 50 to 70 volts. To vary the current taken by the arc, a shunt regulator may be fixed in the fireproof compartment and connected to the field coils of the generator.

The motor-generator will, of course, require some attention in the matter of oiling, cleaning and renewals of brushes, and the risk of breakdown will obviously be slightly greater than with the other method. For emergency purposes, therefore, it is advisable to retain the resistance coils, connected up so that the operation of a change-over switch will throw the arc on the supply voltage through the resistance coils.

The diagram above shows the connections for this arrangement on a three-wire supply. The machine and resistance coils have been placed in the basement of the theatre, while the shunt regulator, D.P. switch and ammeter are fixed on an iron panel in the operating box. A pair of 19/18 cables and a 3/22 lead are required between the basement and the box, and the whole arrangement conforms in every respect to the Cinematograph Act.

Museum of Safety Appliances.—Mr. Wardle recently asked in Parliament whether any arrangements had yet been made for a museum of safety appliances in this country. Mr. McKenna said the Government had decided to establish such a museum, and the arrangements were in hand. The selection of the site had taken a little time, but the offer of a suitable site in a central position in Westminster had now been accepted, and provision had been made in the Estimates for commencing the erection of the building in the course of the present year.

The Johannesburg Gas Engines.—Under the heading "The Gas Engines Again," the *South African Mining Journal* for April 6th says: "The notorious Johannesburg municipal power station gas engines have been repurchased by Messrs. Beardmore, and are now under option to a well known South African financier. It is on the cards that they will figure in a new electrical power scheme at an early date."

THE COST OF TRAIN LIGHTING.

By C. TOONE.

There can be no doubt that electric lighting is the safest possible means of illuminating railway passenger vehicles, and there are now so many excellent systems of energy production, or transport, and of distribution of current from coach to coach, that a suitable arrangement is to hand for every class of railway, and, apart from discussions as to the illuminating "qualities" of the various sources available, the adoption of electric lighting turns mainly upon the question of annual cost. A number of authorities have *estimated* the latter for various lighting systems. Dr. Jakob, of Baden, has collected the latest available data concerning five large Continental railways, using respectively :—A, oil gas and ordinary mantles ; B and C, ordinary coal gas and inverted mantles ; D, electric lighting from accumulators ; E, electric lighting from carriage dynamos. The chief of the results derived are given below, together with simple formulæ for estimating the total annual costs of the various systems considered (see also *Elektrotech. Zeit.*, January 11th, 1912).

As a basis of estimate and comparison, assume a mixed second and third class eight-wheeled coach, running 62,500 miles per annum at an average speed of 30 m.p.h. ; then the running hours per annum average 2,000, to which may be added 20 per cent. to cover stoppages and lighting in stations before and after arrivals. An allowance of 300 c.p. per coach and burning hours equal to half the total running hours is assumed. Gas or accumulator equipment may have 24 hours, and the battery in a dynamo equipment 10 hours' capacity.

Including capital, maintenance and energy charges (and all wages reasonably chargeable to this account), the lighting and total costs per annum, in the cases referred to above are given in francs as follows :—

Case.	A.	B.	C.	D.	E.
Actual lighting ...	182·0	103·1	86·6	177·5	59·4
Total annual cost "K" of lighting equipment	492·3	493·0	526·6	652·8	376·5

From these figures it will be seen that the total costs of the above lighting equipments average 500 fr. for the gas systems, 650 fr. for electric lighting from accumulators, and 375 fr. for electric lighting from train dynamos. Depreciation and maintenance constitute the chief items of expense in the accumulator system ; depreciation costs are rather higher in the dynamo than in the gas equipments, but the former effects very important economies in maintenance and the actual cost of current production.

A general formula for the total annual cost (K frs.) of a lighting system is—

$$K = C_1 + C_2W + C_3B,$$

in which, W = the annual track miles traversed, expressed in 100,000's of kilometres ; B = lighting period, expressed in 1,000's of hours ; C_1 C_2 C_3 = constants depending on the lighting system employed.

For gas lighting :—$K = 150 + 125\,W + 194\,B$, and $h = 0{\cdot}065 + 50/1{,}000 \cdot B + 41{\cdot}25\,W/1{,}000 \cdot B$ (h = centimes/c.p.-hour).

For accumulator lighting :—$K = 171{\cdot}25 + 155 \cdot W + 272{\cdot}5 \cdot B$, and $h = 0{\cdot}0912 + 57{\cdot}5/1{,}000 \cdot B + 51{\cdot}25 \cdot W/1{,}000 \cdot B$.

For dynamo lighting :—$K = 152{\cdot}5 + 158{\cdot}75 \cdot W + 55{\cdot}75 \cdot B$, and $h = 0{\cdot}0175 + 51{\cdot}25/1{,}000 \cdot B + 52{\cdot}5\,W/1{,}000 \cdot B$.

The fixed charges and those dependent on the distance travelled, are much the same in each case, but the 1,000-hour value of those depending on the lighting hours are about 200 fr. for gas lighting, and 272 and 54 fr. for electric lighting by accumulators and dynamos respectively. Lighting by accumulators alone, is always very costly.

If the fixed costs be equal, the cost of lighting by gas and by dynamo is the same when $B/W = 1/4$, *i.e.*, when one hour's lighting is required for every 400 kms. train miles (about 8 hours' run). For longing lighting periods per train mile, the dynamo system is the cheaper.

On very long journeys, such as are common on Continental and American railways, it may be necessary to carry a double supply of gas or two sets of accumulators. Such a necessity at once enhances the relative superiority of the dynamo system and the new equations for K become :—

Gas ...	... $K = 150 + 169 \cdot W + 194 \cdot B$
Accumulators	... $K = 275 + 244 \cdot W + 275 \cdot B$
Dynamo	... $K = 150 + 150 \cdot W + 56 \cdot B$

and dynamo lighting shows considerable economy even for small values of B (the lighting hours). The general conclusion to be derived from the above notes is that dynamo lighting is always preferable to accumulator lighting for trains, and that the former will usually show a greater or less economy over ordinary incandescent gas lighting.

NOTES FROM CANADA.

[FROM OUR OWN CORRESPONDENT.]

Attention is drawn in a Canadian engineering paper to failures of the casings of water turbines, several of which have, apparently, occurred recently. It is pointed out that, although theoretical knowledge of turbine design is advancing, the number of accidents of the kind referred to is on the increase. Long penstocks are blamed for the trouble, combined with insufficient provision for relieving pressure therein when extra strain comes on owing to variations of load. Hydraulic engineers are advised to pay more attention to making ample provision to relieve the turbines and penstocks from excessive strain or pressure.

The Canadian Pacific Railway intends to use oil fuel on its locomotives in Vancouver Island, the idea being that there will be less likelihood of starting forest fires with this fuel than with coal. In the interior provinces of the country, however, as in many parts water-powers are available, it is not unlikely that electric power may be utilised in the future, especially as both coal and oil are expensive on account of the cost of freight.

The Canadian National Exhibition, which is held annually in Toronto, is to be open this year from August 24th to September 9th. In a pamphlet issued by the management it is stated that the exhibition has been held annually since 1879. The year 1912 is to be "Imperial" year, according to announcement, as "H.R.H. the Duke of Connaught will officiate at the opening ceremonies . . . and the special attractions will be such as to reflect the glory of the British Empire." The Dominion Government has granted $100,000 this year for certain buildings. Visitors come from all parts of Canada, and large numbers of Americans patronise the exhibition. The buildings are mostly of a permanent character, as they are required each year. The grounds cover 264 acres, situated on the shore of Lake Ontario. The exhibit space of some of the larger buildings amounts to over 410,000 sq. ft. Many of the streets of Exhibition City are paved, and the electric lighting plant is capable of supplying 20,000 lamps. In 1909, 752,000 persons visited the exhibition, while last year the number rose to 926,000. Allotments of space are being made now, an entrance fee equivalent to practically £1 being charged, but only firms having representatives in Canada are allowed to exhibit. Sketches or descriptions, indicating the character of exhibits and materials to be used in their construction and decoration, must be submitted to the manager for approval.

The writer would like to see all British electrical engineering and, for the matter of that, mechanical engineering firms who are represented here combine their forces and endeavour to form a British section in the exhibition. This would be much more imposing and would attract a great deal more attention than if, as seems at present to be the case, each firm applies for space independently, their exhibits being scattered about the building indiscriminately. If principals at home would ask their representatives over here to communicate with your correspondent, he would be glad to make every endeavour to carry this scheme into effect by approaching the management on the subject ; and even were such efforts not entirely successful this year,

the way would be paved for their more complete realisation next year. The writer has already ascertained that the exhibition authorities would give facilities for the carrying out of such a scheme as far as they could.

Another matter demanding the most serious attention of British electrical engineering firms is that of obtaining better recognition of their products by the fire insurance companies here; the remark applies more particularly to cables and wires, switches, fuses and general accessories, rather than to motors and generators. It is a strange thing that in one of the most important parts of the British Dominions, it is almost impossible to introduce many articles of first-class design and construction although no valid objection on the score of their being unsafe, can be raised, as is proved by their efficiency in England.

The difficulty appears to lie in the fact that the only rules for electrical work at present in force are those of the Fire Underwriters, whose headquarter laboratories are in Chicago, where everything is gauged by purely American standards. These rules are all right for U.S. manufacturers, but why should first-class British goods be debarred from a British Possession by American regulations?

The only reply one can get here is, that what is all right in the old country is no good here. To a very limited extent this may be true, but is it not plain to anyone that it is in the interests of the American manufacturer to foster this idea? The sooner united action is taken by home firms and their representatives here the better. It is difficult to see why the great fire insurance companies of England, who are all represented here, should not be perfectly willing to accept the materials and apparatus used at home when it comes over to this country; perhaps the B.E.A.M.A. could induce them to do so. The effort is well worth making—nay, it is absolutely essential that something shall be done, and done at once, if Great Britain wishes to obtain, not the lion's share, but any share at all, of the trade of the Dominion, so far as the electrical industry is concerned.

The trade returns for 1911 show, under the heading "Electric Apparatus," total imports into Canada of the value of $4,972,881, of which $4,615,968 is credited to the U.S., and only $393,563 to the United Kingdom—a state of affairs which, without any doubt, is due in large measure—though not, of course, entirely—to the fact that the British manufacturer is seriously hampered in the manner already indicated.

The formation of a Canadian branch of one of the British electrical organisations, as suggested in a recent editorial in the ELECTRICAL REVIEW, would be an excellent thing, for combined action, having real power behind it, could be taken on both sides of the water; but the time for it to be formed is *now*—not next year or the year after; active steps should be taken at once.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

City Guilds Examinations and Easter Holidays.

There would not, at first sight, appear to be much connection between the above, but there is really a very serious one.

At certain Institutions Easter holidays, extending over three or four weeks, are allowed to intervene between the work of the classes and the examinations. This is surely a very serious state of affairs, and it passes my understanding that the City and Guilds of London Institute should allow it.

It is obviously unfair to both students and teachers, and it seems to indicate the overshadowing of technological education by University methods. Is it not a fact that the work of the City and Guilds Institute is to be absorbed by the Board of Education? Perhaps it is already so? Anyway, remembering the status and aims of the majority of the students attending these classes, the fees they have paid—often with some effort—and the anxiety of most of them to pass their examination, it seems a direct slight to them to break the continuity of their work at the most critical part of the session. The Christmas break (sometimes two or three weeks) is bad enough.

I sincerely hope this matter will be thoroughly ventilated.

d'Auvergne.

The I.E.E. Students and the New Articles.

I have read with interest your article in this week's ELECTRICAL REVIEW concerning the proposed alterations of the Rules of the I.E.E., and would take this opportunity of emphatically protesting against the practice in vogue at the present time in this Institution whereby the one class of members, which, in my opinion, will suffer most by the new Articles if they are passed, and also one which the Institution has of necessity in the future to chiefly depend on for its support, is altogether ignored. Needless to say, I refer to the Student members.

Already repeated attempts have been made for a long time past to persuade those responsible to print the lectures given by the Students before the Student Section, but without success; and now alterations are brought forward for adoption affecting this particular class of member more than any other, and the Students are treated with entirely undeserved contempt, are not consulted in any way at all.

Can it be wondered at that difficulty is experienced at the different Technical Colleges in getting Students to join?

Is it too late for the students as a body to organise a protest which could be sent to the President before the meeting on May 9th next?

H. Douglas Steers.

Rugby, *April 26th*, 1912.

The Ideal House, Olympia.

I notice in your article dated April 26th, 1912, on the Ideal Home Exhibition you state that Messrs. John Barker and Co. were the contractors for the furnishing, including the decorating and electric light fittings.

As the architect for the House, I should like it made known that the decorations were carried out by Messrs. H. and G. Taylor, of Parklangley, Hayes Lane, Beckenham, and that the electric light installation was carried out by Messrs. R. A. Lister, Ltd., of Dursley, Gloucestershire.

Reginald C. Fry.

London, E.C., *April 27th*, 1912.

[We regret the error pointed out by Mr. Fry—who, by the way, was the winner of the *Daily Mail* Ideal Homes Competition, his design being adjudged the best out of 700 submitted. The official statement was "The Ideal House is equipped throughout by the decorative and furnishing experts at Barkers," and no mention was made of any other contractors except the builders, Messrs. H. and G. Taylor.—EDS. E.R.]

LEGAL.

OSRAM LAMP WORKS, LTD., *v.* THE "Z" ELECTRIC LAMP MANUFACTURING CO., LTD.

(*Continued from page* 672.)

MR. JUSTICE WARRINGTON then asked Mr. Astbury to call his attention to the specification of 1907.

MR. ASTBURY said the complete specification was No. 8,653 of 1907, and it said: In the manufacture of illuminating bodies such as those for electric incandescence lamps from tungsten, by subjecting raw filaments composed of finely divided particles cemented together, to a sintering process, a very strong contraction took place. This contraction did not always take place uniformly, and the resistance of the illuminating bodies consequently fluctuates within certain limits. In the first sentence his Lordship would notice that what he called a raw filament was a filament in its form prior to sintering.

It had been found that this contraction proceeds more uniformly if the filaments treated were subjected to a gentle pull, or put in slight tension during the process, whereby they were caused to contract. Means for affecting this pull or tension, such as the loading of a stirrup or loop-shaped filament, by a small weight attached to the stirrup or loop were known of themselves, and had been used for the purpose of drawing out filaments already into a pointed form. The new process consists in acting upon or loading the raw filament while in the course of manufacture. By that means several advantages were secured. Firstly, the disadvantage of irregular contraction already mentioned was avoided. In addition to that considerable commercial advantage was attained, inasmuch as a simplification of the manipulations required for the formation of the finished filament was affected, as well as a saving in the plant required, in so far as the shaping by pointing out of the filament, did not necessitate a second operation. Finally, the number of useless filaments produced was materially lessened, as filaments which were deformed during the sintering process, in consequence of deficient quality or careless handling without being loaded, yielded when loaded serviceable finished filaments. The process consisted therefore, broadly, in subjecting raw filaments of tungsten, or tungsten composition, while preferably in a loop form, and whilst acted upon by a load to a process, such as the sintering treatment which turned them into finished filaments, whereby the chemical actions—that was the decarbonising, and physical operations or reactions—that was the welding together—which took place, converted the filament, whilst under the expanding or stretching action of the load. The load might consist of a small weight of any desired kind, as, for instance, a small hook of metallic tungsten. The difference in the claims was quite obvious when they were read. The first claim was a process for the manufacture of illuminating bodies of tungsten or tungsten composition, according to which a raw filament was provided with a load and was then subjected to operations or reactions adapted to complete the formation of a finished filament, substantially as set forth. The next claim was limiting that to a small hook of tungsten. The third patent was a process for the manufacture of metallic illuminating bodies for electric incandescent lamps, according to which a raw loop-shaped filament consisting of finely divided particles of tungsten cemented together was loaded with a small weight attached to the loop, and was then subjected to a sintering treatment adapted to convert the raw filament into a finished filament, substantially as set forth. The difference between the first and the third was that the first one included the decarbonisation as well as the sintering, and the third was the subjection to a sintering treatment.

Dealing with the plaintiffs' third patent, COUNSEL said he was not quite sure of the category in which he put the invention. He thought that when his Lordship came to consider the anticipations on which defendants relied, he would come to the conclusion that they were really the steps that helped plaintiffs to build up that which showed the value of this invention. Dealing with the anticipation—there was the carbon filament, which, after being built up and squirted through the die, only went through one subsequent process, which was the baking or carbonising. It was in that process that the filaments jumped about and cockled up. After they came out of the oven they ought to have been filaments, ready to put straight into the lamp. When the metal filaments came along, for years they did not weight them during the carbonising, and there were many reasons why they did not. One was they put the filaments lying down into trays all touching, and they were pushed into a red-hot furnace-tube, which had a protective non-oxygen atmosphere in it, and what happened was that the hydro-carbon was volatilised out by heat. In that process they did not all jump and cockle about. After that process was finished they were subjected to something which the carbon filaments were never subjected to—decarbonising—and the result was beads, but not beads as was generally understood by the word, because the particles were as fine as flour, and the object of putting in a binder was because manufacturers knew that this metal sand could not hold together by itself, and in order to be able to squirt it out, a certain gummy substance was used to hold it together. It was also known, that there must be a period when that was burning out rather than sticking the metal together by fusion, and the extraordinary fact was that the inventor found out what he did by hanging a little weight on when it was in that gummy condition. He knew the weight in the carbon case, because he could test it by its then ability to stand the strain, but in the other he could not because he knew that it was going through a process of disintegration. When the filament was put into the jar, it began to shake about as soon as the current was turned on. The two sides first straightened out. Then it began to glow and then to contract, and the sides to grow straight. When the point of fusing was arrived at as distinct from mere decarbonising, the bottom portion thinned out to a point, the weight pulling it to an acute angle, and the filament was finished absolutely straight. The weight, said counsel, was a little bit of wire, the weight of which must be such as would not pull through and break. Before this invention and after the carbon filaments, experts deliberately set themselves to find out when and how they could put this load on, in order to make the thing the shape they must make it. They were, however, never able to make it anything like so thin as plaintiffs made it under this patent. What they did was, when the decarbonising was finished, to adopt an entirely new process. They put the thing back into a jar, then put a weight on and turned on the current, making it as hot as they dare and then tried to melt it up again and strain it with a weight. He did not think any objection had been raised to the specification, as that was quite plain. The first page of the specification plainly told of the disadvantages of the previous method, viz., that the irregular contraction was saved plus the added labour of doing it after the filament was sintered. It then told: "The process consists of, broadly speaking, in subjecting raw filaments of tungsten or tungsten compositions"—that was the carbonised filament—"while preferably in a loop form, and whilst acted upon by a load to that process, such as the sintering treatment, which turns them into finished filaments." The word "sintering," remarked Counsel, was used as the complete thing. Reading on, "Whereby the chemical and physical operations (the decarbonising and the welding together), or reactions, which take place convert the filament whilst under the stretching or expanding action of the load," and so on. He thought he need not trouble his Lordship with anything further, and he now proposed to call evidence. With regard to the evidence, defendants had taken the view that they were entitled only to show plaintiffs the very finest class of filaments which they made. Plaintiffs were suing them for infringement with regard to the whole of the manufacture of their filaments, and sooner or later would want to know how they made their thicker filaments, and what the different percentage of gases were, and what the times were which they used in connection with the thick filaments. Further, they asked that their process should be divided *qua* those their filaments into two, and that plaintiffs' experts should generally only see the filaments made down to the time when they were put through what he might call their first sintering process, and that they should not see the remaining completed process which took place in the lamp bulb before it was sealed. That second process was only seen by Dr. Passmore, and that gentleman had to say whether, in his opinion, it was relevant to infringement. Of course, he had no doubt about it the moment he saw it, and he so reported that it was proposed to call him first, so that his Lordship should be in possession of the facts *quâ* that. He would, no doubt, have to ask his Lordship to afterwards determine how and when plaintiffs should see how defendants made their filaments.

Evidence was then called.

DR. FRANCIS WILLIAM PASSMORE, under examination, said the usual way to make a carbon filament by squirting was to dissolve cellulose—cotton-wool (which was the carbon), or something of that kind—in a solvent such as zinc chloride, the latter being mostly used for that purpose now. That solution of cellulose was then squirted through an orifice, which coagulated the cellulose and removed the greater part of the zinc chloride. The filaments are then washed and dried, and heated to a temperature at which the cotton-wool was decomposed, leaving the carbon only.

From 1880 until 1898, practically there were nothing but carbon filaments?—The first metallic filament was osmium.

MR. WALTER (to WITNESS): Dealing with osmium, to what class of metal does that belong?—The precious metals, and it is a very expensive metal, and extremely rare.

Dr. Welsbach suggested coating metallic wire with osmium by saturating a carbon filament with osmium?—That is so.

He did that by taking finely powdered osmium, and mixing it with collodion and squirting it?—Yes.

From 1898 to the date of the patent in 1904 have you examined the whole of the specifications which have been set out in the particulars of obligations?—I have done so.

Do you find certain suggestions as to the treatment of tungsten?—Yes.

Do you find a process suggested for compressing tungsten?—Yes.

The first one I think is Kellner, No. 19,785 of 1898, and that suggested the use of thorium, titanium, chromium and wolfram, by moulding the metals with metallic oxides?—Yes.

Asked as to Tibbit's specification, No. 6,104 of 1889, WITNESS said that dealt with a strengthened carbon filament. It was not a metallic filament at all. In the same way as tungsten was used to strengthen steel, so it was suggested to be used here for strengthening the carbon filament. Tungsten was largely used for the strengthening of steel. In this process tungsten was to be deposited on carbon for the purpose of strengthening the carbon filament.

MR. WALTER explained that by this process a coating of tungsten was deposited on the carbon filament. More or less of the tungsten penetrated into the pores of the carbon and filled them up, thereby imparting greater strength. Then, said Counsel, there was the Lodyguine, that was an American specification of 1897. That was a fillet patent.

WITNESS, examined as to this specification, said it was for depositing various metals, amongst them being tungsten, upon another metal, which acted as a holder. It also mentioned platinum and said that carbon might be used. There was no method described by which the fillet could be removed—that remained a permanent part of the filament.

Take carbon with a tungsten deposit; would that be of any value as a filament?—No; that is what Just and Hanaman refer to in the first part of their specification.

Then there is also Siemens No. 20,277, of 1904, which suggested the use of metals, including tungsten, in the form of drawn wires?—Yes—first of all fusing the metal.

Taking tungsten itself?—It is practically impossible to work it. There are no directions given here to work it, and I do not know how to work it.

There are modern ways which indicate how tungsten can be treated?—I have heard so.

MR. WALTER: The specifications Nos. 12,156, 12,157, 12,159, of 1902, are all patents for vanadium, tantalum and niobium.

His LORDSHIP: Were they drawn-wire patents?

WITNESS: No—powdered metal or oxide was mixed with paraffin and moulded.

MR. WALTER: The actual practical tantalum lamp, I think, was a drawn-wire lamp?—Yes.

With regard to the squirting process, was the art of squirting bodies (in 1904) with various binding agents so as to make filaments from them, a well-known art in the first instance?—Yes, but mainly from the osmium patent.

Was there more than one solution known in respect of binding agents?—Practically any sticky organic solution would answer the purpose.

Was it known what solutions could be used and what could not be used for squirting?—The making of filaments generally was a well-known industry at that time.

As regards the process of destructive distillation, the carbonising process, were the methods of carrying that out well known?—Certainly they were.

MR. WALTER: Reading the whole of the literature up to that time, is there anything that would suggest to you the use of tungsten for the purpose of a filament and the process of its manufacture?—Certainly not. There was much in the literature that would have warned me that tungsten was not suitable.

With regard to the specification No. 23,899 of 1904, that invention has reference to incandescent electric lamps, and has for its object the production of an incandescing body composed of wolfram (tungsten), the names being interchangeable?—Yes, that is so.

The object sought to be attained was to prevent the disintegration of the carbon?—Yes.

WITNESS further said that tungsten in the presence of carbon and high temperature formed carbides; carbides were a class principally worked on by Moissan, the French chemist.

With regard to the carbides relative to conductivity, do they act in the same way as the metal itself?—Yes, to a large extent.

For the manufacture of filaments of this finely divided kind referred to in the specification in the squirting process, is the question of fine division important?—The division must be fine enough to prevent any blocking of the very fine orifices.

Is the fineness dependent on the thickness of what you are going to get?—Yes.

What is tungstite?—It is the anhydride of tungstic acid WO_3. It is found in Cornwall, but only in very small quantities.

MR. WALTER: Then there is tungstic acid?—Yes, that it is a term applied to a whole series of bodies going out from the anhydride, containing more or less water of hydration, or more or less water of combination. There are quite a series of acids derivable from the anhydride. Witness, continuing, said tungstic acid was a term which was applied to quite a series of commercial articles, some of which were more or less insoluble in ammonia, and some were more soluble. In regard to tungstic sulphide, that was a combination of tungsten and sulphur. That was WS_3—that was the tridulphide, and the most common one. In addition to the binding medium referred to in the specification, collodion was a solution of cellulose in chloride of zinc or cuprous ammonia oxide or the like—there were other bodies used for binding agents such as gums and sugar.

MR. WALTER asked witness to deal with the time when the filament was squirted. The tungsten or tungsten-compound was mixed with a ductable binding agent, and then squirted. In that condition it is a flexible body with no carbon but hydro-carbon?—Yes, or carbo-hydrates?

Asked to describe what then took place in the carbonisation, WITNESS said the carbonaceous compounds were decomposed or destroyed, exactly in the same way as distilling coal. The hydrocarbon bodies in the coal were broken down with a formation, if not entirely of carbon, at any rate of carbon and compounds of carbon and hydrogen, which were very slightly volatile.

So to put it in a simple way there was a coke thread?—Yes.

Holding in its pores the metal?—Quite so.

Is it at all brittle?—Yes, but it is astonishing what an amount of pliability there is.

MR. WALTER: Then the carbon which has served only as a binding medium is removed by subjecting the filaments to a passage of current in an atmosphere of steam and hydrogen, thus raising it to a high temperature.

Asked to describe what one would see when the filaments were subjected to the passage of current in an atmosphere of steam and hydrogen, WITNESS said there would be no effect until one got the faintest red glow. As the current was increased the temperature got higher; but if there was carbon present in such an atmosphere with the same voltage the temperature would fall again. That was due to the fact that the carbon had been burnt out, and there was better conductivity. Consequently, the voltage of the current must be raised in order to keep the temperature up. The temperature was raised as high as possible, in order to remove all the carbon. The removal of the carbon left interstices between the sand and the metal, which as the temperature increased contracted instead of the filament falling apart as one might expect when the carbon was removed. The result of the contraction was that the filament shortened. The condition at the end was a continuous thread.

And is the whole thing melted, or is it a surface action?—No, it is not a true melt; but, of course, it has softened, and become adherent.

COUNSEL, referring to the passage—"By this process the carbon is completely oxidised so as to form carbonic oxide, and a filament of tungsten is left." It is suggested, said Counsel, that that passage does not give sufficient instructions to enable anyone to carry out the process?—I have tried it with as little and as much steam as I can get in at all temperatures, and it always answers.

With dies as now used, and filaments as now used, what is your experience as regards the filaments as they actually come from the first process. Do they require equalising, or are they equal as they stand?—Under the microscope they appear to be equal.

If it was necessary to equalise them, there is that process to deposit tungsten as described—tungsten on the surface?—Yes.

With regard to the passage: "Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we wish it to be understood that we are aware of the German patent No. 154,262."

WITNESS (interrupting): That is the substitution process of tungsten for carbon.

It then goes on: "and of the English patents, 19,785 of 1898 (the Kellner patent) and 20,277 of 1904 (drawn-wire patent of Siemens)."

Have you read through the earlier specifications which are said to anticipate this invention?—Yes.

Do you find the invention in any of those earlier documents.—No?

Now, coming to the defendants' specification, 18,622: "This invention relates to an improved method of producing metallic incandescence bodies for electric glow lamps. In a previous application, 19,379, of 1905, my correspondents have described a method for producing incandescence bodies for electric glow lamps from common heat-resisting metals, such as molybdenum, tungsten, vanadium, tantalum, consisting in first producing crude incandescence bodies containing carbon (such as are pressed from a powdered metal with the addition of an organic binding material) and then heating same in an atmosphere that simultaneously reduces or preserves the metals and oxidises the carbon until the metals have been freed from carbon or contain only such a minute residue of carbon as not to injure the quality of the incandescence body. The object of the present invention is, whilst retaining the reducing gases, to replace the oxidising gases by such gases as remove the carbon, though not in the form of a compound of carbon and oxygen, that is by oxidation, but in another form." The reducing gases referred to, what is the meaning of that?—The gas which will reduce tungsten oxide to tungsten metal.

MR. WALTER: The substantial effect is protective?—If the tungsten oxide had been there in the first place, and had not been fully reduced in the carbonisation process, the reducing gas would reduce it to metal.

"In carrying the invention into effect, the removal of the carbon is effected by the use of gases containing no oxygen, and especially in the presence of nitrogen, which is used either in the form of a mixture containing a large proportion of reducing hydrogen, or better still, in the form of gaseous ammonia"—ammonia is a compound of nitrogen and hydrogen?—Yes, one part nitrogen, and three of hydrogen.

Does nitrogen ever, when obtained from ammonia or when in the presence of hydrogen, operate to remove the carbon in the way described in the specification?—Yes, but nitrogen alone will not.

Assume you have these gases present and also carbon, and then raise it to a high temperature—does a chemical change occur?—Yes, to the extent to which cyanide forms.

Assuming you had enough carbon, what temperature would be required?—Somewhere about 1,400 or 1,500°. For the formation of cyanides it is higher.

Is it within the temperature that you get out of an incandescent lamp?—Yes.

It is, however, below the temperature which you get when you incandesce the metal filament with electric current?—Yes.

There are a large number of specifications referred to also with regard to that. Have you read through those referred to in the pleadings?—Yes.

And do you find the invention described there?—No.

It is alleged that it is not useful. What do you say to that?—I have seen a large number of filaments which have been made in that way in every-day use.

Is it in fact of every-day use?—Yes.

As regards the sufficiency of the specification, do you find any difficulty, or any want of instructions, in the specification?—Not at all.

Asked as to certain experiments, WITNESS said he had seen the operation repeated with the actual apparatus supplied by the defendants. The process, as he saw it, was the removal of the carbon in an atmosphere of hydrogen and water vapour. Describing the experiments, witness said the internal part of the lamp was prepared—the stem. Then there was a certain amount of mixture painted on the centre rod. That mixture consisted of a mixture of phospham and amorphous phosphorous 7 per cent., mixed with alcohol and ether into a paste. The girl operator had a little basin containing this mixture by her side exposed to the open air, and on each stem she painted a certain quantity of the mixture.

His LORDSHIP pointed out that witness had omitted some details.

WITNESS said he had. The lamps were sealed on to the pumping apparatus, which was connected with two pumps forming a rough vacuum and a fine vacuum. First of all the rough vacuum was turned on for a few seconds to take out the bulk of the air in the lamp, then the fine vacuum was turned on. At the same time the gas was lit around the bulbs, which were hooded over so that the temperature round the outside of the bulbs was raised. The bulbs were heated from the outside immediately the fine vacuum was turned on. Eventually, the temperature outside, the witness was told, reached 300 or 360°. The fine pumping, continued witness, was continued for a varying period which was determined by the disappearance of the phosphorescent discharge in a Geissler tube, which was attached to the pumping circuit. Then they turned a low-voltage current on through the filament for a 220-volt lamp. After four or five minutes the voltage was increased to 80, and at intervals the voltage was gradually increased to 100, and 120, and so on up to 220.

The operation varied with the number of lamps which were being pumped. During the first 10 minutes the filament was a cherry red, and as the voltage was increased it became more red. Then the gas and current were turned off, and the lamps allowed to cool, and they were then sealed. The small thing at the bottom of the globe was where it was sealed off to maintain the vacuum. The object of the outside heating was to drive away the moisture on the inside surface of the glass bulb. In the preliminary heating the phospham was being acted upon by the heat, and ammonia was being developed. Water vapour would all be sucked away during the first two minutes. As the phospham began to decompose, ammonia would be given off, but there would be slight traces of moisture still. No one could say the exact point when all the water was removed. After the first ten minutes there would certainly be no water vapour there. He had had samples of the filaments at the time they were put in the lamps. In the estimation of carbon in such matters, Witness said he preferred to have a special expert to make the analyses, because the quantity was so small; he handed them to Sir James Dewar. The result as regards the proportion of carbon contained in the filaments before they were put in the lamps (not the same filament, but the same batch) was '081 per cent. From the filaments which witness took out of the lamps the percentage was '019. He had made tests to detect the presence, if possible, of cyanogen and hydrocyanic acid, but he was not able to, although he found ammonia. During the 20 minutes while the heating was taking place the nitrogen and hydrogen would be removing some carbon. He had made a number of experiments as to the action of ammonia on the various carbon filaments. Although he could not detect cyanides coming from a closed bulb, he had no difficulty in tracing cyanides when he passed nitrogen and hydrogen over carbon filaments in a stream. Even when he put filaments in the lamps as a matter of experiment with a large amount of carbon in to start with and put phospham on the stems and treated them in the same way, he could not detect the cyanide then, though he was quite sure cyanide must be formed. It appeared that he had to have a current of gas to wash the cyanide away in order to be able to detect it, otherwise it was decomposed again.

Mr. Walter said that the third patent 8,563, said: "In the manufacture of illuminating bodies, such as those for electric incandescent lamps from tungsten, by subjecting raw filaments composed of finely divided particles cemented together to a sintering process, a very strong contraction takes place. This contraction does not always take place uniformly, and the resistances of the illuminating bodies consequently fluctuate within certain limits." You have seen a good many filaments treated, just simply the baked filament, sintered without any weight?—Yes, thick filaments behave all right. As soon as you come to fine filaments, they simply float about, touching one another. Each one that I saw failed.

Counsel reading on: "It had been found that the contraction proceeded more uniformly if the filaments treated be subjected to a gentle pull. Means for affecting the pull such as the loading of a stirrup or looped-shaped filament by a small weight attached, are known of themselves, and have been used for drawing-out filaments already finished into a pointed form." Have you seen that process carried out?—Yes, it does not produce the same shape. Witness, continuing, said, in the first place, sometimes one leg was more bowed than the other, and the same sharp point was never obtained. These matters were of importance for the purpose of manufacturing electric lamps. Mr. Walter, reading further: "The new process consists of acting upon or loading the raw filament while in the course of manufacture. By this means several advantages are secured. First, the disadvantage of irregular contraction is avoided. In addition, considerable commercial advantage is obtained as a simplification of the manipulations required for the formation of the finished filament is effected as well as a saving in the plant required, in so far as the shaping, by pointing out of the filament, does not require another operation. Finally, the number of useless filaments produced is considerably lessened as filaments which would be deformed during the sintering process in consequence of deficient quality or careless handling without being loaded, yield, when loaded, serviceable finished filaments." Does that accord with what you have seen?—Exactly.

"The process consists, therefore, broadly, in subjecting raw filaments of tungsten or tungsten compositions while preferably in a loop form, and whilst acted upon by a load to that process, such as the sintering treatment which turns them into finished filaments, whereby the chemical and physical operations or reactions which take place convert the filament whilst under the expanding or stretching action of the load. The load may consist of a small weight of any desired kind, as, for instance, a small hook of metallic tungsten." You have read through the whole of the various documents alleged to anticipate that.

Do you find anything there which describes the invention, or anything that would lead you to do this?—No, the last three or four patents had been granted to men who were trying to make shaped filaments. They were men of experience who apparently had not dared to put on a weight at an earlier stage.

It is also said that the invention is not useful. Does it enable filaments to be manufactured?—As regards fine filaments it is positively essential.

Cross-examined by Mr. Terrell, Witness said that the Delabine process was not necessary; he had made tungsten filaments without it. The Delabine process was well known for obtaining tungsten in a finely-divided form, and was known prior to the date of the patent somewhere about 1899. Next came a process of calendering. There were two steel rollers with very fine surfaces very highly pressed one against the other, and one travelling faster than the other. The result was the same as would be got with a pestle and mortar, only much better. He had never heard of the term "a hard paste process." The paste was driven through a die at a great pressure. Counsel suggested that it was the use of this hard paste combined with a high state of calendering that enabled commercially the very fine filaments to be made which can be worked on the 200-volt circuit. Witness said he was sure all filament lamps were not made by that process. The filaments are then placed in trays, and placed in a furnace with a partial vacuum, and the temperature was raised to about 1,000°. Volatile matter was formed before that temperature was reached, and carbide of tungsten. The next step was the "sintering" process, which he called the decarbonising process. The filaments were attached to clips for the purpose of conducting the current. These filaments were now raised for about two seconds to a very high voltage current in an atmosphere of hydrogen at a pressure of about 70 millimetres. Having put the filaments on a holder, a globe was placed over them and nine-tenths of the air was pumped out and hydrogen slightly turned on, till an equal volume of hydrogen to the air which was left in, was admitted, the pressure increasing to 140 millimetres. The tap leading to the vacuum pump was then turned on and the hydrogen was left flowing the whole time, washing out the jar to a certain extent. He had made experiments with a view to ascertaining what the contents of the bell jar were as regarded the moisture, in the Osram works. A little of the moisture came from the hydrogen, but mainly he thought from the sides of the jar and from the rubber disk at the bottom of the jar. They sintered for about two seconds for each filament. Those filaments had been made by the "Z" Co., and they also tried it with some of their own. The diameter was about '03 millimetres; they were thinner filaments. First the filaments glowed red as the current passed through; then as the temperature was raised gradually by an increase of the voltage to about 1,800°, the filaments all shrank. By sintering he meant getting rid of the carbon and closing up the texture of the fibre.

Counsel said that first of all they had a filament containing carbide, and that the carbon was in the form of a carbide there. The filament got to a high temperature there, when it got hotter the carbon was volatilised and left the tungsten behind free from carbon, and during that process there was a partial fusion, which was the result of the process of sintering, and without which effective sintering could not be done?—Witness replied that immediately one had a red heat, the steam began to operate, and one had carbon being removed in the form of carbon monoxide, with a resulting better conductivity of the filament and resulting decrease in the filament.

Do you know if you treat a filament with steam and hydrogen, you do not get sintering or shrinkage as described in the specification of Just and Hanaman?—I say I do.

Mr. Terrell: When you treat by this process, which is described in the patent being sued upon—the Patent 23,899—do you know that what happens is that the whole of the carbon is eliminated chemically by the action of oxygen upon the steam?—Yes.

Is it a fact that these filaments will not sinter at all, but remain friable whatever you do?—They do sinter. I have not been able to get rid of the carbon without producing contraction at the same time, more or less.

And is not that because it is not removed by oxidation, but by volatilising the carbon, a semi-fusion of the carbide tungsten which produces the sintering?—No.

You know that the bell jar soon gets coated with carbon, and that it has to be wiped out, as it is so thick that the operator cannot see what is being done?—I have seen a little sometimes, and have occasionally washed them out.

Witness said that the proportion of carbon was about '8 per cent. before they began the sintering process, and the filament loop weighed somewhere about a milligram. Part of the steam came from the hydrogen which was incompletely dried, but the greater part came from the sides of the bell jar and from the rubber bottom. The water particles could be plainly seen when the vacuum was turned on. The atmosphere of the bell jar was changed at the rate of 400 litres an hour, as measured by an instrument inserted in the connection between the hydrogen cylinder and the bell jar.

His Lordship: I understand that for this purpose you have tried it on thicker filaments?—Yes, because it is absolutely impossible to determine everything with the fine ones. He heated the larger filaments in a current of hydrogen saturated with vapour at about normal temperature. To find out if the carbon had been removed, he determined the carbon mon-oxide in the gases that came off.

You do not suggest here in this case that there is water vapour introduced for the purpose of removing the carbon by the "Z" company, do you?—Certainly, as the process was explained to me.

Dealing with certain specifications alleged as anticipations, witness agreed that Welsbach started by using osmium, which then cost about 4s. per gramme.

Counsel suggested that a gramme would make about 1,000 filaments, and that the cost of the metal was practically insignificant, while the cost of osmium was to that of tungsten as 5s. to 1d., or something less.—Witness: Much less; it is about one-fortieth of 1d.

Mr. Terrell: Welsbach was working on osmium. He says in his specification:—"My invention relates to the manufacture of incandescence electric lamps, and has for its object the production of illuminating conductors for such lamps, which can be worked at a high temperature, and which give forth a brilliant light." The metal filament lamp owes its success to high temperature, and it will bear a higher temperature than a carbon lamp?—Yes, but that is only one reason; the other reason is that it conducts less as it

gets hotter. You could get more light with the same amount of current with the metal-filament lamp than you could with the carbon-filament lamp.

The specification goes on:—"By one part of my invention I accomplish this result by constructing the illuminant substantially of the metal osmium, a substance which when pure can endure without melting or volatilising a temperature as high as even the volatilising temperature of iridium if placed *in vacuo* or in certain protective gases."

Another passage says: "It cannot be formed into wires either by drawing or pressure. It is necessary, therefore, to devise special methods by which it can be made into filaments suited for use in incandescence electric lamps."

Witness agreed that it was known in 1898 that tungsten could be made into a wire, and that the problem Welsbach had was how to make a continuous wire out of a thing he could not draw.

Mr. Terrell said he relied as an anticipation on the second method and the preliminary paragraph he had referred to.

"The principle of this method is to take a carbonaceous filament and to cover or saturate it with an osmium compound, and then by electrically heating the conductor so formed in a suitable protective atmosphere to burn out the carbonaceous matter, and thus leave a coherent filament of osmium. Instead of a carbonaceous filament being taken, I may use the equivalent method of a carbonaceous binding material."

Witness agreed that this was the same process as the plaintiffs used. The only difference between them being that Welsbach was using osmium and plaintiffs used tungsten.

Another passage in Welsbach's specification says: "This method, as well as the first method, may be employed to form filaments of highly resistent metals of the platinum group and their alloys for the purpose of being used in the way hereinafter set forth in connection with the portion of my invention that relates to the use of refractory oxides." There he tells you exactly the chemical process used and the chemical action used by Just and Hanaman?—Except that it is osmium instead of tungsten.

Welsbach thought there were carbides of osmium?—There is a distinction. Tungsten forms carbide quite readily, osmium does not. That is one reason why you cannot say, because steam and hydrogen act upon one, they can act on the other.

Mr. Terrell: There is no chemical action now at all in the plaintiffs' specification is there?—Yes, I think there is, because there is a double reaction. Of course there is nothing new as regards the oxidising carbon, but it is doing two things at one time.

There is nothing new as regards the protection of the metal?—There is something new in protecting the metal in the presence of steam.

Welsbach had protected the metal by a hydrogden atmosphere in the presence of steam from the oxidising effect of the steam, when he was using osmium?—Yes, but osmium was an oxide which was very readily reduced by hydrogen—tungsten is not. Then, again, osmium is a metal which does not combine with carbon—tungsten does. You can get the osmium reduced in a comparatively small proportion of hydrogen, but with tungsten it is necessary to have a large proportion of hydrogen.

I have shown you now by going through the Welsbach specifiction, that you have got exactly the same process for the same purpose applied to osmium, and by referring to this I have shown you that long before the use of the metal, tungsten as a useful filament was recognised?—Yes.

And that the properties of tungsten were known as far as this was all concerned?—Some of the properties of tungsten were known.

There is a passage in Lodyguine's specification that my attention is drawn to as follows:—"In practice it is necessary that the illuminant should be capable of enduring a very high temperature, especially because the energy consumed per candle-power decreases very rapidly with increase of temperature. It was found that platinum fused at a temperature lower than that which is required to produce a commercially efficient lamp. Metal possesses inherent qualities which render it a more desirable material for forming an illuminant than carbon. Thus, the loss of heat by radiation at a given temperature is found to vary considerably with the character of the surface. A carbon filament loses a large amount of heat by radiation, and this detracts materially from the amount of light emitted. A metallic illuminant affords a surface of a much brighter and better character for light radiation, and a less opportunity for heat radiation than is usually obtainable from a carbon filament. For this reason a metallic filament has advantages over a carbon filament." Then he describes a process for making a tungsten filament?—He makes those remarks not particularly as to tungsten, but as regards a number of metals. As to some of those metals, he has not proved correct.

Do you know that the process of Lodyguine works perfectly well?—Perfectly well as regards the deposition of tungsten, but as regards making a lamp, No. He had tried it, and could make a lamp of sorts, but it would blacken, because the fillet was left in. He said it might be removed, but he did not say how it was to be done.

Mr. Justice Warrington: I do not see any directions for removing it. It is merely permissive to remove it. I see in each case he says "containing a fillet."

Mr. Terrell (to witness): I will take you now to a specification of Just and Hanaman, 154,262—a German specification.

His Lordship: It is one which they disclaim, is it not?

Mr. Terrell: Yes. It says, "Tungsten and molybdenum belong, amongst others, to the metals which are particularly suitable for incandescent bodies in consequence of their high melting points and high volatilising points." That is probably at the date of this patent. It goes on: "The idea of utilising tungsten and molybdenum for incandescent bodies is by no means new, and there already exist various processes for the production of particular coatings of these metals of platinum filaments or carbon filaments. The present invention relates to the manufacture of incandescent filaments of pure tungsten or molybdenum metal. As is well known, the oxyhalogen compounds of these metals—for instance, the oxy-chlorides—are reduced by hydrogen at a red heat with the formation of metal, hydrogen-halogen compounds and water. If, therefore, a glowing metal filament or carbon filament was brought into an atmosphere of tungsten oxy-chloride vapour and excess of hydrogen, the reduced tungsten was metallically deposited on the carbon or metal filament, with the result that an incandescent body was produced, consisting of a core of metal or carbon and a coating of tungsten or molybdenum." All that is what was well known. Now, he is going on to what he invented. "Careful experiments have now shown that under certain conditions the reaction proceeds quite differently. If a carbon filament is subjected by means of an electric current to a high temperature in the vapour of tungsten oxychlorides, in the presence of only very little hydrogen, a most remarkable reaction occurs. The carbon filament is gradually transformed completely into a filament of pure tungsten, a process which has already been employed in an analogous manner for the manufacture of osmium filaments by glowing carbon filaments in an atmosphere of osmium tetroxide. The carbon combines in the present case with the oxygen of the oxychloride, with the formation of carbon monoxide or carbonic acid, the chloride is reduced by hydrogen to hydrochloric acid, and the tungsten is deposited in the place of the carbon in accordance with the equations. When the carbon has been completely replaced by tungsten it is of advantage to increase the current of hydrogen and the tungsten is now deposited on the tungsten filament formed, strengthening and equalising it in accordance with the equations. Conditions for the attainment of these reactions in which the carbon is replaced by tungsten are—excess of oxychloride, the presence of very little free hydrogen and a high temperature of the carbon filament. In case of excess of hydrogen and a too low temperature of the filament, the other known reaction occurs in which the oxychloride is reduced exclusively by hydrogen without the carbon taking part in the reaction. When using molybdenum the reactions proceed quite analogously. In order to produce incandescent bodies in accordance with the present invention, one evaporates tungsten oxychlorides in a vessel in which the carbon filament is inserted whilst hydrogen is passed through the vessel in a very slow current. The carbon filament is now burnt to a bright heat by means of an electric current passed through it, whereby the above-mentioned process of the substitution of tungsten for carbon proceeds. When the carbon has been completely consumed and replaced by tungsten, the tungsten reduced by the hydrogen alone is then deposited on to the filament, as can be seen by the sudden and progressive fall of the resistance. It is now the time to increase the current of hydrogen in order to obtain an even deposit of the metal and an equalisation of the resistance, which can be here regulated at will, as in the treatment of carbon filaments." Going so far, the exact commercial process referred to in the plaintiffs' specification is given to you by Welsbach. The use of tungsten is said in this very specification of Just and Hanaman to be an idea of utilising tungsten and molybdenum for incandescent bodies, which is by no means new?—Yes, but this does not give a pure filament; that is the reason why he struck it out of his specification. You cannot get the carbon removed; the tungsten seems to deposit more quickly than the carbon can get out.

I now come to specification 10,815 of 1899, Menges. Do you say the second part of this reaction which is mentioned here—that the filaments can be formed as described in Just and Hanaman, 154,262—will not work?—I have not tried that process.

Why do you say that this gaseous tungsten cannot keep on acting on the carbon in the filament?—Because it is a very heavy vapour which is continually depositing metallic tungsten on the filament.

But it can only do that so long as it is removing the carbon?—No, you need not have any carbon at all, and you can get metallic tungsten deposited.

Then you did get a coating of tungsten?—Yes, that is what Loydguine did.

Then the coating of tungsten stands between any further action on the carbon?—Yes, substantially.

You would not say that it is impossible to make a tungsten filament according to the directions given?—No, following the directions given here, I could not.

The next specification is No. 14,411 of 1901, Sanders patent—the second one. He says: "The present invention relates to improvements in the manufacture of conductive bodies for the production of electric light and heat. The purpose of the invention is to provide filaments, rods or bodies of any other shape, which can be used for the production of electric light by using, as a base for the manufacture of the filaments, electrically conductive bodies containing metals for the manufacture of electrically conductive bodies"—not "for the manufacture of filaments."

His Lordship: The manufacture of filaments and other conductive bodies.

Mr. Terrell: I ought to have read it that way.

Witness: It must have originally stood "electrically conductive bodies."

Counsel questioned Witness in detail in regard to the process and said: they describe exactly the process which the defendants do in their manufacture, do they not?—As regards the making of a plastic mass and squirting into filaments.

And sintering?—Carbonising. Heating in hydrogen?—Yes. By electric current?—Yes. Commencing at a low heat and ending up with a very high heat?—Yes. There is nothing said there about steam. If they do this, according to you, they inevitably will get steam in?—Yes, they take no precautions to exclude it.

According to you, if he carried out this process he could not help having moisture?—If he had moist hydrogen.

Not if he had moist hydrogen, but if he had a moist bell jar, which he could not help having according to you?—I agree.

According to you, he could not help having moisture?—He could if he dried it completely.

His LORDSHIP: He does not take any means of excluding it?—No.

(To be continued.)

SMOKE NUISANCE PROSECUTION: APPEAL.

ON April 25th the Lord Chief Justice and Justices Pickford and Amory, in the King's Bench Divisional Court, heard the appeal of the Greenwich Borough Council from a decision of a stipendiary magistrate. The respondents were the London County Council, and it appeared that on November 9th, 1910, the Borough Council summoned the London County Council for causing a smoke nuisance from their electric generating station at Greenwich. An order was made on the Council that they should at once abate the nuisance and prevent a recurrence of it. That was done, but on April 9th, 1911, another nuisance was caused by smoke, and a summons was at once taken out, the allegation being that the County Council had made default, and had not complied with the order to abate the nuisance. The magistrate, however, dismissed the summons, holding that there had not been a recurrence of the nuisance which would allow him to say that the County Council had been guilty of default.

MR. BODKIN, for the appellants, argued that the magistrate was wrong, and delivering the judgment of the Court the Lord Chief Justice said there was no question here whether the County Council could have put in better appliances for the abatement of the smoke nuisance, for it was admitted that they had the most up-to-date machinery. There was a distinct lapse of four months between one offence and the other, and the Court could not agree that there had been a default of the order, or that there had been a recurrence of the nuisance.

The appeal was accordingly dismissed.

TRAMWAY ACCIDENT CLAIM.

MR. JUSTICE LUSH and a common jury, in the King's Bench Division on April 25th, heard an action in which a baker and confectioner of Southfields, Wimbledon, claimed damages for personal injury against the London United Tramways. The plaintiff's case was that on August 23rd last, he was riding a bicycle in Hayden's Road, when he was knocked down by a passing tramcar. The evidence as to the cause of the accident was conflicting, but the medical evidence agreed that the injuries were of a serious character. The jury found for the plaintiff, with £120 damages.

BAXTER & CAUNTER *v.* PERFECTA SEAMLESS TUBE AND CONDUIT CO., LTD.

THE plaintiff firm, of 86, Charing Cross Road, W.C., were before Mr. Edward Pollock, High Court Official Referee, on April 26th in an action against the defendant company, of Aston Manor, near Birmingham. They claimed to have an account taken of commission and moneys alleged to be due and owing to them from the defendants under an agreement of May 23rd, 1906, entered into between the parties.

Mr. Ralph Bankes, K.C., and Mr. Whateley appeared for the plaintiffs, and Mr. Hollis Walker, K.C., and Mr. Whadcock represented the defendants.

MR. BANKES said his clients' case was that they were entitled to commission on orders obtained for the defendants for tubings and fittings previously to the termination of the agency. Plaintiffs also contended that they should have commission on orders coming in after that date, as those arose from plaintiffs' introduction of business.

MR. L. G. CAUNTER, one of the members of the plaintiff firm, stated in the course of evidence that they had acted as agents for the defendants for some years prior to the agreement of May 23rd, 1906. They entered into the written contract of May 23rd, 1906, which expired in the ordinary course on January 31st, 1909. The witness mentioned that, as a matter of fact, when they first took the agency over, the defendants had no electrical business at all. "We introduced the whole of that business for them," he added.

Evidence was called on behalf of the defendants.

MR. A. E. HILLS, managing director of the defendant company, stated that they had furnished the plaintiffs with an account of all commissions and money due to them. The witness added that they had never withheld any information from the plaintiffs. The witness further stated that this tube business formed but a small part of the defendant company's operations.

Legal arguments were advanced on both sides.

The learned OFFICIAL REFEREE, giving judgment, referred to the fact that orders obtained from a firm named Taylor and also the Office of Works figured in this claim. In the case of Taylor, the specification provided that Perfecta tubes alone should be supplied, with the result that whoever had to comply with these specifications must go to the defendants to obtain their tubing. In the other case, that of the Office of Works, the specification provided for Perfecta, "or some equally good tubing." The engineer might be perfectly satisfied with tubes other than the Perfecta. In that case it was clear that the defendant company were supplying them, in competition with others, and therefore, they made their prices in conformity with the lowest price. In the other case, however, they might make their own bargain, and obviously sell their goods at a much better price. Plaintiffs were claiming to be paid commission upon the basis of those cases where Perfecta tubes alone were specified. It seemed to him that the onus was on plaintiffs to satisfy him (the Referee) in respect of these cases where they claimed commission on Perfecta tubes alone specified. It was not for the defendants to show that they were not liable. He must come to the conclusion that regarding the Office of Works, plaintiffs had not proved their case. There would be judgment, on the other point of the claim, for the plaintiffs of £7 10s. above £69 14s. 7d. paid into Court.

On the question of costs, MR. HOLLIS WALKER argued that the case could have been tried in the County Court, as there was no reason to take an account.

MR. POLLOCK said he doubted if a County Court judge could have taken this case, and, accordingly, he gave plaintiffs costs on the High Court scale.

METALITE, LTD.

IN the Chancery Division (Companies Winding-Up Court) on Tuesday, Mr. Justice Swinfen Eady dismissed the petition, without costs, of A. B. Reckitt and three other shareholders of Metalite, Ltd., for a compulsory order to wind up the company.

Mr. F. Russell, K.C., and Mr. Tomlin appeared for the petitioners; and Mr. Gore Browne, K.C., and Mr. Wells for the company and £94,000 in value of shareholders, in opposition to the petition.

His LORDSHIP said the company, whose business was the manufacture of lamps and metal filaments, appeared to have been promoted by a company formed for that purpose, the Electrical Trust, Ltd., which was to underwrite £150,000 worth of shares, and it had not 150,000 pence. This company—the Metalite, Ltd.—had been crippled in its resources by not having sufficient working capital. There had been grave irregularities in the way in which the directors had dealt with the company's money. But the fact that there had been grave irregularities in the management of the company's affairs was not necessarily, and alone, sufficient cause for winding up. It was said the substratum of the company was gone. But the facts appeared to be that the company had a well-equipped factory, that it was continuing to manufacture lamps and filaments, that it was making a profit on its trading, and that its business was increasing. It was engaged in placing debentures, and, moreover, it had two debts from the vendor companies in respect of unpaid shares. Under these circumstances, he was of opinion that the petitioners had not made out a case for a winding-up order.

DISPUTED ELECTRICITY ACCOUNT.

AT the Wolverhampton Police Court, on Saturday, Elijah Stott, licensee of the Golden Cup, Navigation Street, was summoned for non-payment of £5 17s. 8d. for electricity consumed in the June, September, and December quarters of 1911. Mr. J. Atkinson (town clerk's department) prosecuted. Defendant disputed the claim, and was defended by Mr. T. P. Haslam. The chief clerk for the Corporation electricity department said that at the beginning of last year, defendant's meter was, at his own request, tested and found to be working correctly. Witness had pointed out to defendant that in the past he had benefited by an old meter. In answer to Mr. Haslam, witness said that the suggestion that he had told defendant that they were only "getting their own back," was preposterous. The distribution engineer said that defendant had been using a larger number of lamps than was recommended by the Corporation. Defendant, said Mr. Haslam, was anxious to pay his account, but he only wished to pay for what he had consumed. In 1910, said defendant, he made a complaint with respect to the increase in his accounts, and an arc lamp was removed, but the accounts still rose. On a second complaint, he was advised by a Corporation official to have a slot meter. The Bench decided that the account should be paid in full, and the chairman (Alderman Bantock) added that they wished the electricity department to understand that they did not like accounts to run into arrears. Complaints should be promptly dealt with.

Labour Unrest.—In the April issue of the *Engineering Magazine*, Mr. J. B. C. Kershaw commences a series of articles on "Labour Unrest in the United Kingdom." The introductory article commences an analysis of the various causes that have led up to the present position of affairs, and it is the author's intention to discuss the significance of these causes in their relation to the social and industrial welfare of the community, concluding by indicating what, in his opinion, is the most hopeful method of avoiding strikes, and of regulating the future relations between capital and labour.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION FESTIVAL DINNER.

On Wednesday last week, the annual festival dinner of the Institution was held at the Hotel Cecil. The President, Mr. S. Z. de Ferranti, occupied the chair, supported by Mr. Justus Eck, deputy-chairman, and Mr. Hugo Hirst, and about 100 members and their friends were present. After the loyal toast, the President proposed "The Electrical Trades Benevolent Institution," remarking that the object of the dinner was to make a special appeal for subscriptions, and to get them to give all that they could to this most meritorious Institution. The electrical industry was a big and far-reaching one, but it had been sorely handicapped by various restrictions, and had not prospered as it might have been expected to. This made the necessity of many of its members all the greater. There was fearful competition in the electrical industry, the margin between success and failure was very narrow, and they incurred many risks, which all contributed to bring about the unfortunate cases they would like to help. It was a fallacy, as Mr. Hirst pointed out last year, to suppose that if a man was down it was necessarily his own fault, even if he were constitutionally deficient; and what a blessing it was to be able to lend a helping hand to him, to enable him to tide over his difficulties! He had himself been prejudiced in the past by the existence of two such funds—that of the Institution of Electrical Engineers and that of the Benevolent Institution—which, he had thought, would militate against the success of either; but the secretary, Mr. Hawes, had pointed out that two beggars were better than one. He did not say that it would be better to combine, but those interested might with advantage consult together so as to attain the best results, widening the scope of the funds and making them more effective. The Benevolent Institution was at present progressing satisfactorily; the life subscribers numbered considerably more than last year, and things were looking healthy, but they were troubled by the smallness of the amount available to meet the demands that would arise in the future. In the absence through ill-health of Sir W. H. Preece, a great amount of work had fallen upon the deputy-chairman, Mr. Eck, and the energetic Committee, all of whom had done good work. His hearers also could be of great assistance, both by themselves giving and by getting their friends to contribute to the fund.

Supporting the toast, Mr. G. Harland Bowden said that he had been deeply impressed with the great amount of self-sacrificing labour accomplished by Mr. Eck, and had determined to do his utmost to help him. He suggested that the Committee should address an explanatory letter regarding the position of the Institution and the results of its work to every employer of labour in the electrical trades in Great Britain, and ask them to call meetings of their employés and explain to them what it meant to become a member of the Institution. The big manufacturers were in a position to organise their own benevolent funds, but the smaller ones could not carry them on, owing to the heavy working expenses and the disproportionately heavy risks incurred; but the Institution provided the necessary organisation, and he thought many employers were not aware of the facilities which it afforded. The objects of the Institution were clearly defined on its letter paper; the persons described belonged to a class not provided for by trade unions, and many of them had incomes over the £160 limit of the Insurance Act. By paying 10s. a year, these persons could qualify for a pension, and the Institution wanted funds to provide those pensions. He pointed out that a subscription or collection of ten guineas gained a vote for life, and suggested that they should all agree to take collecting books and each qualify for a vote by Whitsuntide.

Mr. J. Hunter Gray also supported the toast. He said that no "inducements" were necessary to support the Benevolent Institution; it was the bounden duty of every member of the industry to support it. It was not entirely due to the innate ability of his hearers that they occupied their present comfortable positions; they had had, and had taken advantage of, their chances. Others had missed their chances and fallen into difficulties. This was not a "charity" dinner, but one to remind them of their duties; the electrical industry must look after its own members.

The President, in summing up, announced that grants had been made since January 1st, 1912, of £11 10s., £6 16s. 6d., £2 and £6—total, £26 6s. 6d. He regretted the unavoidable absence of Lord Vaux of Harrowden (Vice-President), who was also to have supported the appeal. He then gave the toast, expressing the hope that they would afterwards fill up the subscription forms with which they had been provided.

Proposing the health of the President, Mr. Hugo Hirst expressed his regret at the absence of Mr. E. Garcke, who was to have given the toast, more especially because his absence was due to indisposition. There were many associations connected with the industry, and it might be a good thing for them to address the committees instead of individuals and gain their assistance. But the campaign need not be confined strictly to the electrical industry; while their own dividends had been poor, they had greatly benefited a variety of other industries, and might very well invite them to help in the good work. He regretted the smallness of that gathering, in view of the honour done to them by the presence of Mr. Ferranti, whose name was one of which the industry might well be proud, and would live with that of Kelvin as representing the best work that their generation had done. His spirit had permeated the whole electrical industry, and they believed that better times were coming, largely due to the optimism which he had inspired.

The toast was drunk with enthusiasm, and was accompanied with musical honours. In responding, Mr. Ferranti announced that the subscriptions obtained at the dinner amounted to £182 10s. 6d., and the donations to £249 18s. 6d., a total of £432 9s., which compared very favourably with £258 17s. 6d. collected at the dinner last year. That was a good omen for the success and rapid growth of their undertaking.

A programme of music was performed during the evening by Messrs. G. Benson and C. Dixon and the Misses Annie Rees and Ethel Wynne, with Mr. W. J. Petty at the piano.

The statement of accounts for the year 1911 shows on the revenue side, from dividends and interest, £72; subscriptions, £82; donations, £474; legacy of the late Mr. G. Byng, £100; balance of amount from Olympia Exhibition (1905), £379; balance from Festival Dinner, £1; total, £1,108. The expenditure was for printing, &c., £65; auditors' fee, £1; salaries and office expenses, £122; five grants, £35; total, £223; leaving a balance of £885. The balance-sheet showed investments in various 3½ per cent. stocks of £3,248, and cash in hand and at bank £165, making a total of £3,413, from which a sum of £62 due to the secretary is deducted, leaving a net balance of £3,351.

We have received the following letter on the subject of the Institution's affairs:—

"The excellent record-breaking response in subscriptions and donations to the eloquent speech of Mr. S. Z. de Ferranti at the Festival Dinner on the 24th inst. is most gratifying, but it would be a pity to allow such a wave of enthusiastic support to die down.

"In the addresses made to the assembly on the same occasion by Mr. G. Harland Bowden and Mr. J. Hunter Gray, suggestions were made as to the desirability of every man in a responsible position in the industry immediately securing a collecting book and (before Whitsuntide) turning into the funds a small but definite sum of money, thereby either becoming a life subscriber or securing free membership for the year, and also as to its being the bounden duty of every man interested in the electrical trade to secure membership by paying in his very small annual subscription.

"The Committee would be deeply indebted to you if, by insertion of this letter or otherwise, you would bring it home to your many readers that the collecting books are now ready for issue, and will be issued by the Institution's Secretary, Mr. F. B. O. Hawes, 18, Park Mansions, South Lambeth Road, S.W.

"There are, as stated at the Festival, hundreds of electrical firms who would like to see their employés members of the Institution, and thus given the protection which a large body can, and a small business cannot, give.

"Will the principals and managers of all electrical firms select the names of one or more nominees for the collecting books, and immediately transmit them to the secretary? A small meeting in or immediately after office hours was suggested by Mr. Harland Bowden as a means of explaining the objects of the Institution, and the rules formed for its working, and to enable the most enthusiastic responsible and capable collectors to be chosen and at the same time secure support from the most distant parts of the country in an economical manner.

"The new books of rules are available upon application to the secretary, and contain very interesting information as to the work done in the past and the prospects of the future. Let every electrical man know what we are doing, why it must be done, how he can help, and give to the Electrical Trades Benevolent Institution that co-operative help which costs him little, but does much for a good and enduring cause.—Yours faithfully,

"Justus Eck, *Deputy-Chairman.*"

These suggestions are admirable; it is wonderful what can be done with a collecting book, by the aggregation of many small items. It seems very probable, too, that the existence and objects of the Benevolent Institution have not yet been made known to the persons who are most interested in its work—those who fall within the definition of eligible beneficiaries, and who, being unassisted by trade unions, would gladly become members of the Institution if given the opportunity. We trust, therefore, that all employers who have the interests of their staff at heart will take steps to carry out these simple proposals.

Municipal Employment.—At the meeting of the Lancaster Town Council on the 24th ult., a discussion arose in respect of the dismissal of A. S. Bretherton, an electrician, who had been employed as a switchboard attendant. It was urged that his dismissal was due to his having asked for overtime rates when he was put on a double shift in the works, but in the absence of the chairman, members of the Committee said Mr. Bretherton had been guilty of insubordination, refusing to work unless he got overtime pay. The action of the Electricity Committee was eventually confirmed.

Marconi Cricketers.—The Marconi Athletic Club held an enjoyable smoking concert on Saturday, April 27th, to mark the termination of a successful football season, and to inaugurate the cricket season. The club have acquired a first-class ground at Acton town, where they are erecting a commodious pavilion. The first match of the cricket season will be held on Saturday, May 11th. The Marconi club have a few vacant dates during the forthcoming cricket season, and they are anxious to arrange for home matches with electrical or engineering works clubs.

BUSINESS NOTES.

Consular Notes.—Turkey.—The British Consul at Constantinople reports that the concession for lighting Constantinople and supplying electric power has been granted to a group composed of the Hungarian firm Ganz & Co., the Société Havraise d'Energie Electrique, the Société d'Application Industrielle, of Paris, the Banque Suisse de Chemins de Fer, and the firm of Giros and Loucher. There is talk of a trust to be formed by this group with a number of German and French banks to control the electrification of the tramways and the lighting of Constantinople. The trust would have its headquarters in Brussels, and would command a capital of £4,000,000. The concession for the installation and working of a telephone system in Constantinople and its suburbs was granted to an Anglo-American group, which has formed an Ottoman company, called the Société Ottomane des Telephones de Constantinople, with a capital of £300,000. It is stated that the telephonic communication will be established 18 months after work is begun. A scheme for an electric railway from Constantinople up the Bosphorus, put forward by Messrs. Lentz & Co., of Berlin, is now before the Council of State, after being approved by the Council of Ministers. The length is 21·7 kiloms., and there are to be 18 stations. The line requires 4·7 kiloms. of tunnels and the same length of viaducts, and must prove a very costly undertaking.

Ecuador.—The British Consul at Guayaquil reports that the Electric Light and Car Co. has now two long and important car lines in the city. A new line is also in course of construction, and will shortly be opened. The effect of these lines has been disastrous for the old Cia de Carros Urbanos, with mule traction. The works were very well advanced at the time of writing; the tunnels and pipes conveying the water of the Chimbo to the turbines were nearly completed, and it was expected that the completion of the works could be looked for early in 1912. The transmission-line towers from Bucay (Victoria) to Doran were also nearly all put up. A very successful future was promised as a result of this enterprise, as there should be between the different sugar estates and industries along the line and in Guayaquil, ample employment for all the power which the turbines can produce, and at very remunerative rates.

Morocco.—The British Consul at Tangier reports that the wireless telegraph system between Tangier and the ports at present seems to be working in a most unsatisfactory manner. On all sides complaints are being made by the merchants that, even though they mark their messages "urgent," and in consequence have to pay treble rates, yet frequently two, and sometimes three, days elapse before these messages reach their destination. Naturally the French military authorities have the first call on the system, but it is to be hoped that it will be put on a more business-like footing without delay. A wireless installation has also been established at Fez, which, if worked properly, should prove of great value to merchants.

Russia.—The Austrian Consul at St. Petersburg, in a recent report, states that even if the Russian electrical industry is not as yet capable of satisfying the total home demand, it has made rapid steps in that direction during recent years. The largest electrotechnical works in Russia are those of the Allgemeine Electricitäts Gesellschaft, in Riga, and Siemens, in St. Petersburg. On a somewhat smaller scale are the Volta Works in Reval, and the Westinghouse Works in Moscow; apart from these, there are also some smaller works which have not up to the present been of any very great importance. The extension of municipal electrical undertakings in St. Petersburg, and in other smaller towns, during the last year or two, has been such as to call for increasing supplies of electrical material, so much so that Siemens, at least, have found it necessary to erect new dynamo works in St. Petersburg in order to produce high-tension machines. The Volta Works, also, have decided to extend their plant. Another branch of the Russian engineering industry which has rapidly developed, is that concerned with the production of petroleum motors. The construction of these motors of the Diesel type, is carried on by the Russian Diesel Motor Co., to which belong the Ludwig Nobel Works in St. Petersburg, Felsen & Co., in Riga, and the Chantier Naval, in Nicolaieff. The number of motors produced by this company for Russia has increased from seven in 1899, to 127 in 1909, and the power from 180 H.P. in 1899, to 14,557 H.P. in 1909. Apart from the ordinary Diesel motor for coupling to dynamos, the Ludwig Nobel Works also construct motors for ships. Petroleum motors find an increasing demand in Russia for electric power stations for ordinary industrial uses, and for other purposes. The cheapness of petroleum is the main cause for the popularity of these motors, which, it is anticipated, will lead to an ever-increasing demand.

Brazil.—The Austrian Consul at Rio de Janeiro, reports an increasing trade in electrical machinery and apparatus due to the growing use of electrical power for lighting and industrial purposes. Forty per cent, of the trade is in the hands of American firms, while Great Britain and Germany take 10 per cent. each. In electrical wire there is a very large importation from Germany and the United States; Great Britain also does a fairly large trade in locomobiles and motors for the South of Brazil. Sao Paulo and Santos are the chief distributing centres, and the largest trade is in British hands; the United States and Germany also compete. In lighting materials, in spite of the development of the local industry, there is a large import trade. The chief supplier is Germany, with Great Britain and the United States competing.

Dealing with telegraphic communication in Brazil, the Consul states that the Federal telegraph system was substantially extended in 1910. New stations to the number of 33 came into being, so that at present there are in all 629. In addition, there are 1,514 railway telegraph stations. The receipts amounted to 9,628,497 milreis, as against 8,309,981 milreis in the previous year, and the expenditure to 13,415,661 milreis, as against 12,108,898 milreis in the previous year. Apart from the ordinary telegraph service, the Government has not failed to appreciate the importance of wireless telegraphy. The Babylonia station of the Federal capital has been working since 1909, and it was arranged to install stronger apparatus. Since July and November respectively of 1910 the Amaralina station (Bahia) and the Orlanda (Pernambuco) station have been working, and in addition the Fernando Noronha station, which, under favourable circumstances, can communicate with Dakar. In the course of 1911, it was proposed to put into operation stations on the south coast, one—a powerful station—at Rio Grande do Sul, and two less powerful at Florianopolis and at Mont Serrat (Santos). In the Acre territory three stations were to be opened in communication with Porto Velho and Manhous stations, which had been working since May. Further stations were proposed at Ceara, Maranhao and Para, of which the latter were to be in communication with a station at Amapa, and another on the Rio Branco. With a powerful station on the mouth of the Amazon, it would be possible to communicate with equally powerful stations on the European and American coasts. The number of telegrams sent by the National Telegraphs in 1909 were 2,470,458, with 41,786,401 words. The figures for 1908 were 2,316,491 telegrams, 40,413,693 words, and for 1907 1,929,705 telegrams, 32,632,405 words.

The Austrian Consul at Sao Paulo reports that the imports of machinery and apparatus for electric lighting and power have improved with the general development of the district, and in 1910 amounted to 2,861,129 milreis; the imports from Germany have increased over 100 per cent. as compared with the previous year, and those from the United States over 50 per cent. The imports from the United States amounted to 1,504,121 milreis, those from Germany to 1,024,381 milreis, while Great Britain took third place with only 224,658 milreis. In the cable trade Great Britain appears more satisfactory; the total imports were 386,640 milreis, of which Great Britain supplied 254,246 milreis, the United States 65,054 milreis, and Germany 49,948 milreis. The great demand for cables is caused by the general electrification of all undertakings, even in the outlying townships. Motors using electricity, petrol, gas, &c., were imported to a value of 622.348 milreis from Germany, United States and Great Britain. The telephone system of Sao Paulos has been widely extended in recent years, and at the present time connects with nearly all towns and villages and many of the larger "fazendas." Moreover, the Companhia Telephonica Bragantina was authorised some time ago to extend its system to the municipalities of Limeria, Araras, Pirassunanga, Descalvado, Santa Cruz, Palmeiras, Santa Rita do Passo Quatro, S. Simao, Cravinhos and Ribeirao Proto.

The Austrian Consul at Curityba reports that the imports of electrical machines, lighting materials, motors, meters, &c., are chiefly from France, Germany, United States and England, but as the electrical works which supply Curityba with light and power have recently passed into French hands, it may be anticipated that a great proportion of the trade will pass to French and Belgian firms in the near future.

Lamp Prices.—Messrs. Siemens Bros. Dynamo Works, Ltd., of Dalston, announce reductions in the list prices of Wotan lamps, as follows:—20 to 30 volts, 5, 10, and 16 c.p., pear-shaped bulbs, 2s. 1d. each; round bulbs, 2s. 4d. each.

Dissolutions and Liquidations.—Kevan Electric Co., Ltd., 88, Charing Cross Road, London, W.C.—First and final dividend 2s. 7¾d. in the £, payable at Official Receiver's Office, 33, Carey Street, W.C.

R. A. Ault & Sons, plumbers and electrical engineers, &c., 71 and 73, Talbot Street, Southport.—Messrs. J. E. Ault and R. A. Ault have dissolved partnership. Mr. R. A. Ault will attend to debts, &c.

Catalogues and Lists.—The White Electrical Instrument Co., 2 and 4, Gloucester Street, Clerkenwell, London, E.C.—28-page illustrated catalogue, giving particulars and tabulated prices and reference numbers of many patterns of ammeters, voltmeters, &c., manufactured by them. Further reference to the White instruments appears in our "New Devices" to-day.

The Fredk. Crane Chemical Co., of Armoury Close, Bordesley Green, Birmingham, have issued a catalogue of their frosting and coloured lacquers suitable for electric lamps used for illuminating purposes at public and private social gatherings, entertainments, &c.

Messrs. E. C. Sparkes & Co., 118-120, Wardour Street, London, E.C.—16-page catalogue (No. 148), showing a collection of excellent designs of electric lustre fittings made by Mr. W. J. Stokvis, of Arnhem, for whom the firm are agents. Prices are tabulated in a four-page loose list.

The Harris Patent Feed-Water Filter (1910), Ltd., 24 Grainger Street West, Newcastle-on-Tyne.—Two leaflets, one giving illustrations (half-tone and line) of the Harris-Anderson water softeners and oil eliminators; the other giving information regarding, and a list of users of, the Harris-Anderson patent condenser tube protector for preventing corrosion.

Messrs. J. H. Holmes & Co., Portland Road, Newcastle-on-Tyne.—28-page catalogue containing illustrations of their machinery and manufactures for use in connection with mines and collieries. These show steam engine driven dynamos and alternators, Holmes-

Clayton three-phase motors, "Castle" motors, electrically-driven pumps, motor-driven endless rope haulage, motor-driven air compressors, mining switch cabinets, enclosed switchgear, switch pillars, &c.

The Electrical Co., Ltd., 122, 124, Charing Cross Road, London, W.C.—April stock list of D.C. motors from ½ to 23 H.P., and single, two and three-phase A.C. motors from ¼ to 10 B.H.P.

Messrs. Alfred Phillips & Co., Atlas Works, Tipton.—Eight-page pamphlet showing chains for a variety of service, chain cables, crane hooks, shackles, swivels, stretching screws, &c.

Messrs. L. Andrew & Co., 2, Whitworth Street West, Deansgate, Manchester.—Price leaflet of india-rubber valves, washers and sheets, and asbestos goods, &c.

Messrs. Falk, Stadelmann & Co., Ltd., 83 to 87, Farringdon Road, London, E.C.—40-page catalogue (No. 338) containing illustrations with brief particulars and prices of a variety of "Efesca" electric cooking apparatus, including kettles, water and milk boilers, boiling pans, toasters, sterilizers, hot-plates, hot-plate cooking ranges, grills, hot cupboards, heavy ovens, rapid boilers for screwing at side of oven, laundry and domestic irons, and so on.

Messrs. R. H. Patterson & Co., Ltd., Forth Street Works, Newcastle-on-Tyne.—April catalogue of new and secondhand electrical and other machinery for sale or hire.

Mr. G. Braulik, 8, Lambeth Hill, Queen Victoria Street, London, E.C.—A number of pamphlets giving prices, weights and particulars of a variety of goods made by Mr. Paul Firchow Nachfgr, of Berlin, for whom he has been appointed sole selling representative for these manufactures in this country and for export. The information in the lists relates to time-switches, distance time-switches, float and compressor switches, automatic switches for electric signs, remote control switches, &c.

Important South African Railway Workshops Scheme.—The Metropolitan Railway Carriage Building Co., of Birmingham, has recently been making inquiries at different South African centres with a view to establishing an extensive branch of its works in the country. A representative of the company, Mr. Peyton, visited Bloemfontein a short time ago in connection with the matter, and it is understood that he is convinced that this is the most naturally suitable site for the proposed works. Mr. Peyton has also visited Durban and Cape Town in the course of his investigations. In February, Mr. C. L. Botha, M.L.A., heard of his presence in the country and of his mission. Mr. Botha interviewed him, and outlined the advantages which Bloemfontein could offer, and put him into touch with the local municipality. After visiting Natal, Mr. Peyton went on to Bloemfontein and discussed the matter with the Mayor. He was received with the greatest cordiality and in a proper business spirit, and definite offers of a favourable nature were made to him on behalf of the Town Council—as regards a long lease of certain land at a purely nominal rental, cheap water and cheap electric light and power. If the works are established, it is understood that they will be commenced on a huge scale, as it is said to be the object of the company not only to cater for the South African trade, but to make the branch a manufacturing and distributing centre for the markets throughout the southern hemisphere—for India, Australia and South America. At the present time the Metropolitan Co. does an enormous foreign and Colonial business in railway and tramway carriages and fittings, and work of a similar nature. It is stated that the South African works would give employment to at least 1,000 men at the commencement, of whom about 400 would be artisans. It is believed that, should the company establish a branch in this country, the Government would be prepared greatly to reduce the scope of the present railway workshops, leaving most of the construction work to private enterprise, from which better prices would be forthcoming, and confining themselves almost entirely to ordinary repair and maintenance work.—*South African Mining Journal.*

"Mazda" House.—A few days ago we had the privilege of paying an inspection visit to the new "Mazda House," which has risen, to some extent Phœnix-like, out of the ashes of the one that was damaged by fire and water some time ago. It is a commanding building, at 77, Upper Thames Street, E.C., and all things considered, is admirably placed and well laid out for a central depôt for electric lamps and wiring supplies. A building of eight floors, including basement, with an artistic frontage, with a floor space of 20,000 ft., the entire scheme has been conceived and carried out for storing, and conducting the sales of, B.T.-H. manufactures with the utmost facility and convenience which will doubtless both admirably serve the purposes of contractors and the trade, and enable the company to rapidly handle a huge turnover of lamps and wiring materials.

The basement is reserved for glassware and heavy wiring supplies such as steel conduits, lead-covered cables, wood-casing, insulators, iron and wood-conduit fittings and similar accessories. The ground floor is equipped with a clever and expeditious arrangement of sales counters, so that purchasers will procure what they desire with a minimum of delay or trouble. At the first counter Mazda lamps will be sold; at the second the "Gem" and B.T.-H. Edison carbon lamps; and at the third, various accessories and wiring supplies.

The first floor is devoted chiefly to general offices, which will deal with lamp and wiring supplies only, the main offices of the company remaining, as hitherto, at 83, Cannon Street, E.C. On the first floor the typists and clerical staffs will also be accommodated, and seeing that the company specialises in scientific illumination, what it regards as the correct lighting principles have been adopted throughout the buildings. This first floor will afford a good example of their work. The general scheme of decoration of the offices is white, so as to secure the best illumination effects from both natural and artificial light. Mazda Holophane units fixed on the ceiling are the main lighting sources. In the private offices much use is made of "The B.T.-H. eye-rest system," of inverted lighting, by means of which the light is uniformly diffused with the source of light hidden and an absence of glare and shadows. On the second floor there are the publicity department, illuminating engineering department, conference and travellers' rooms, mailing room, stationery stores, telephone exchange and filing room; the third floor is to be devoted to cables, wires, flexible cord and the stock of accessories of the lighter kind, such as switches, fuses, lampholders, &c.; and on the fourth floor is the carbon lamp stock room in which will be stored all types and sizes of B.T.-H. Edison carbon lamps, radiator lamps, and the new "Gem" lamps which the company have recently put on the market. The fifth floor will be the Mazda lamp stock room, where all types and sizes of these lamps, with drawn-wire filaments, in the various wattages and voltages will be stored in quantities sufficient to meet any demand. On this floor, also, the packing will be done, and the storekeeper and despatch department's staff are situated in a suitable office. The sixth floor will be chiefly used as a general storage room, and as the cases required will be made on the premises, a carpenter's shop is to be provided on this floor. The building is electrically-fitted throughout; it is lighted entirely by electricity, has provision for the electric heating of private offices, its cranes are worked by electricity, and a well-appointed automatic push-button electric lift, driven by a B.T.-H. lift motor, runs to every floor. The premises are protected by an electric fire alarm system, and an installation of "Grinnell" sprinklers (477 points), and there is a complete service of electric bells and intercommunication telephones, and a private telephone exchange with three trunk-line connections for outside calls.

The London demand will be adequately cared for in respect of every type, size, voltage, and wattage of Mazda lamp. The need for this large addition to the company's facilities has been made very pressing by the orders for the Mazda drawn-wire lamps having been far in excess of anticipations. But as we have already had occasion to state in our pages, extension of works, as well as extension of stores and offices, occupies a great deal of thought in the B.T.-H. problems of 1912. From the company's report, published on another page, it will be seen that it is putting down a lamp factory at Willesden. At Rugby, since we first visited the works when they were started 10 years ago, the growth has been remarkable. At that date the works covered a floor space of a little over 200,000 sq. ft. They now occupy some 25 acres of land, the floor space having been increased to upwards of 500,000 sq. ft., and they turn out practically anything electrical, from a meter to a turbo-generator. The company gives employment to-day to upwards of 3,000 hands. We have no hesitation in saying that the new buildings, which, as will have been gathered, will well repay a visit, form a worthy and imposing metropolitan representation of one branch of the activities of one of the largest electrical manufacturing undertakings in the provinces.

Bankruptcy Proceedings.—J. Tizzard, electrical engineer, Hill Crest, Abbey Road, Torquay, Devonshire.—The public examination of the above debtor took place at The Castle, Exeter, on Thursday, April 25th. Examined by the Official Receiver, debtor stated that he was accused of leaving Torquay with the intent to delay and defeat his creditors, and that that constituted his act of bankruptcy. Having surrendered, he found that his liabilities amounted to £343, and his assets to £87. The latter consisted entirely of trade debts. In his preliminary examination he made a rough guess of his assets, and put them at £190, or £160 net. Before beginning business on his own account he was a journeymen electrician and a salaried partner in a firm of electricians in the North. While in Newcastle he was separated from his wife under a magistrates' order, and had to pay her £1 a week alimony. He left Torquay on January 28th last, because he received an anonymous letter which stated that his housekeeper no longer meant to keep house for him, and that he would have to look for another establishment. It upset him very much, and after looking over his petty cash book and considering he was solvent, he collected some debts and went away. He did not think he collected so much as £35, as when he arrived in London he had only £21. His liabilities included £180 due to a Mrs. Moss. He wrote to Messrs. Kitson, solicitors, of Torquay, to act for him and collect his debts, but they refused to do so. He gave them no address, and received a bankruptcy petition in Lincoln from his wife, to whom he had sent the alimony while away. Mrs. Moss, in the witness box, said debtor owed her practically £340, without reckoning rates and taxes. The examination was adjourned in order that Mrs. Moss's account might be filed.

A Chile Hydro-Electric Concession.—A correspondent at Santiago writes:—"A very valuable concession has been granted to a group of the most prominent financial and social gentlemen in Chile for a hydro-electric scheme, using the entire water of the Maipo river, which has a minimum water flow of 18·5 cb. m. About 40 km. of land goes with the concession, having a width of 50 m., the land traversing the already surveyed proposed canal, which gives for a distance of 17 km. about 140 m. of effective head, 24 km. at 220 m. head, and 37 km. at 310 m. head effective. With the concession goes a Government (not municipal) electric concession to supply the entire city and suburbs of the capital (Santiago), which has a population of over 500,000 people. At the present time (without any soliciting) not less than 18,000 H.P. can be disposed of in the city and suburbs, not including another 15,000 H.P. in factories, railways (including the State railways), local 20-km. steam railways owned by one of the concessionaires, coppermines, near-by towns, &c. The electric concession is for overhead and underground, no limit of the length of overhead being given, no technical mention of any kind being made so that the concession is an ideal one. Where the 320 m. effective

head is planned, only 30 km. of transmission line is required to reach the centre of the capital (Santiago). The concessionaires are anxious that this important scheme, which has already cost them, for engineers' fees, &c., in surveys and studies, close on £10,000, shall be placed in the hands of British engineers and financiers, principally because their experiences with Britishers have been always the most reliable. Their concessions have been placed into the hands of a very prominent engineer, but any information regarding the scheme and its value can be obtained through the office of the Minister of Chile (Don Agustin Edwards), London. The water concession is for 35 years, and the electric concession for 20 years, which can always be renewed (this being the maximum allowed time in Chile). The plant entire always belongs to the owners, and never goes to the Government, as is the case in other South American countries, such as Brazil. If British capitalists and manufacturers lose this opportunity of securing this hydro-electric scheme, which is described as the largest and most profitable electrical undertaking in the country, their opportunity for gaining any foothold will be lost, and will fall entirely into the hands of Germans, who are hot after these concessions, and are already operating here under an English name, but trading with Germany."

Another correspondent writing on the same subject sends us the following :—"Mr. W. T. Taylor, M.I.E.E., representing Messrs. Preece, Cardew, Snell and others, has been studying in Santiago the concessions of Senor Subercaseaux for the development of a hydro-electric scheme on the river Maipo, near Santiago, and the supply of light and power to that city and its suburbs. According to the studies made by Senor Lagarrigue, a distinguished Chilian hydraulic engineer, the canal should be developed from El Injenio to San Juan de Pirque, a distance of 37 km., and the final power house placed there, at a distance of 22 km. from Santiago. It is proposed to begin the scheme by developing 10,000 H.P. at San José, a distance of 20 km. from the intake at El Injenio. The representative of Messrs. Preece, Cardew & Snell is understood to be highly pleased with the whole scheme and the freedom of the concessions from any complications, as the whole of the people in connection with it are substantial and prominent men. It is to be hoped that British engineers and capitalists will find on investigation that this scheme is a sound one, and can be safely taken up by British capital."

For Sale.—Messrs. Wheatley Kirk, Price & Co., will, on May 31st, sell by auction at the Station Hotel, Newcastle, the works, plant, machinery, goodwill, &c., of Messrs. Ernest Scott and Mountain, Ltd. The Blackburn Corporation has for disposal a quantity of steam and electrical plant. See our advertisement pages to-day.

Patent Application.—Application for restoration of patent No. 14,229, of 1906, for "Improvements in Gramaphones and the like," has been made by B. S. Varnals.

LIGHTING and POWER NOTES.

Aylesbury.—The B. of T. has informed the U.D.C. that a prov. order for electricity supply has been granted to the Council.

Batley.—For some time a special committee of the T.C. has had under consideration a scheme for the extension of the electricity works. The Sub-Committee now recommends an outlay of £8,000 on new plant and machinery (including a 750-KW. reciprocating-engine set, and £8,000 on cable extensions. This recommendation has been approved. It is estimated that the modernisation of the plant and the cable extensions will enable the electrical department to show a profit of about £1,200 a year.

Biddulph.—In connection with the lighting scheme for the district, it is suggested that expert advice be obtained as to the relative cost of gas and electricity.

Birkenhead.—The Electricity Committee has decided to apply for sanction to borrow £14,230 for generating plant, condensers, pumps, &c., and £20,000 for feeder and distributing mains and service cables, estimated to be required during the next three years.

Blackburn.—The borough treasurer reports a profit on the electricity undertaking last year of £1,985, compared with £697 for the preceding year and £1,387 for 1909-10. The income from revenue was £39,037. Ordinary consumers paid for current £22,417; the sale for public street lighting amounted to £1,966; tramways, £10,642; and other Corporation departments, £1,840—a total of £36,920. A sum of £1,262 was allowed for discount. The total expenditure out of revenue was £18,583.

Bridlington.—The T.C. has received from the L.G.B. sanction to a loan of £1,900 for mains and £300 for a C.M.B. balancer.

An exhibition of electrical cooking appliances is to be held during the week commencing May 13th.

Burnley.—The new impulse turbo-generating plant, supplied by the British Westinghouse Co. to the order of the Corporation, was started on April 27th. The machine is of 2,100 I.H.P., and coupled to two D.C. generators in tandem.

Burton-on-Trent.—The electricians and other tradesmen of the town, writes a correspondent, have passed a resolution protesting against the proposal of the Corporation Gas and Electricity Committee to convert the old police station into a showroom for fittings and appliances for use in connection with gas and electricity. It is contended that already tradesmen engaged in this line of business are subjected to very keen competition from the Corporation, and it is thought that, should the showroom be established, although no goods would be sold therefrom, all orders forwarded to tradesmen would be accompanied by a requisition for a 10 per cent. premium. The resolution of protest has been sent to the local Chamber of Trade.

Bury (Lancs.).—The T.C. has received from the B. of T. sanction for the use of overhead lines for the supply of electricity in bulk to the weaving shed of the Co-operative Wholesale Society, and to the Radcliffe electricity works.

Bushey.—The U.D.C. has received a communication from residents in Bushey Grove Road intimating that they wished to approach the Watford U.D.C. for a supply of energy for lighting, and asking the Council to sanction the laying of cable in the district.

Carlingford (County Louth).—It is reported that some experiments have been made in the mountains of this locality with a view towards using the streams for generating electrical power which would be used for the lighting of the town and in the district generally.

Continental Notes.—Italy.—La Societa Cotonificio Trevigiani, of Treviso, has applied for a concession to put down plant to utilise certain available water-power at Revé di-Soligo in the generation of electrical energy for lighting and power purposes.

Austria.—The A.E.G. Union Electricitäts Gesellschaft, of Vienna, is interested in a scheme for the establishment of a central station at Michelsburg, Bohemia, for the electric lighting of the town and district.

Hungary.—In view of the fact that a central electric lighting station, which is being established in Buda-Pesth by the municipal authorities, will not be ready for some time, it is proposed to purchase the existing plant of the Hungarian General Electric Co.

Coventry.—The Tramways Committee has been informed that it can be supplied with electrical energy on the same terms as are granted to the largest consumers, viz., 7·5d. per unit.

Derby.—The Electricity Committee of the T.C. has recommended the application being made to the L.G.B. for a loan of £10,750 for the following purposes:—Mains, £4,500: services, £500: motors, £1,500; transformers, £600; boiler, with chain grates, superheater, and electric feed pump, £2,420; piping, £250; condensing water screens, £280; balancers, £300; and building extensions, £400.

Dundee.—The manager of the Tayside Electric and Gas Light Co., Ltd., Wormit, recently issued a circular in which it was proposed to increase the rates of those having contracts by 15 per cent., and to charge those supplied by meter at 6d. per unit. The circular also invited consumers to become corporate with the company so as to form "a solid combine against adverse influences," and ensure united action when necessary. To encourage this class of customer, 20 per cent. was to be added to those holding contracts, and 30 per cent. to those charged by meter, the addition to form a capital charge on the assets of the company, and to be converted into debenture stock at 5 per cent. The contract system, it was pointed out, had increased by 10 per cent., whilst the current consumed had increased by 100 per cent. At a meeting of consumers last week, the circular was criticised, and the legality of the manager's action in increasing the charges without adequate notice was questioned. It was agreed to meet the manager and discuss the whole question with him, a hint being thrown out that the fairest system would be to charge according to rental.

Edinburgh.—The Electric Lighting Committee of the Corporation recommends that of the £2,796, balance of last year's surplus on the electric lighting accounts, £2,500 be contributed to the King Edward Memorial Fund, and the remaining £296 for improvements at Saughton Park. The Council has already disposed of £5,000 of the surplus.

Erith.—On April 25th a L.B.G. inquiry was held respecting the application of the U.D.C. for a loan of £11,971 for electricity purposes—viz., mains, cookers and heaters, and bunkers at the station. There was no opposition.

Fife.—Messrs. W. Lumsden & Son, of Freuchie, have decided to install several hundred "Schorch" loom motors and motors for driving preparation machinery, these replacing the present steam engines and shafting drives. It is stated that Messrs. Lumsden have exhaustively tested a number of motor-drives before adopting the Schorch Electrical Co.'s proposal.

Finchley.—At a special meeting of the U.D.C. the Finance Committee reported that for the electricity undertaking last year it estimated a profit of £1,045, but that was owing to abnormal circumstances, one being the alteration of the date of payment of a capital charge from March 31st to April 2nd, an alteration which threw the payment from one year to another; the Committee is only estimating a net profit of £262 for the coming year.

Gravesend.—The T.C. has secured new consumers in the firms of the Thames Metal Works and Messrs. Henley's Telegraph Works Co., Ltd. The extension in the latter case will necessitate an expenditure of £1 550.

Heston—Isleworth.—The earliest printed statement of accounts received for the year ending March 31st last (from Mr. Rycroft) shows that a net profit of £150 was made on the Council's electricity undertaking. The output for the year was 1,040,774 units, or only 64,000 less than during the previous period of 15 months. It is satisfactory to see that the consumers and load factor are both on the up grade, and that the cost of production, which has been falling for some years, is now only very slightly over 1d. per unit.

India.—Preparations are in progress for an electric installation in Lahore, under the auspices of the Lahore Electric Supply Co., Ltd. Mr. Jenson, who erected the Durbar power house at Delhi, is the engineer in charge. Arrangements are being made for the supply of electric power on a large scale for all sorts of purposes.—*Indian Textile Journal.*

Llantwit Fardre (Glam.).—The B. of T. has notified the local authorities that a prov. order for electric supply has been granted to the South Wales Electrical Power Distribution Co. for the supply of current in the parishes of Llantwit Fardre and part of the parish of Llantrisant.

London.—Poplar.—Sixty-nine gas lamps are to be converted into electric lamps. This will secure a saving in maintenance of £23 per annum. Electric cooking appliances are to be supplied on hire to consumers at a rental equivalent to 12½ per cent. on the price of the apparatus, no installation to exceed £15 in cost.

Kensington.—The Infirmary Committee of the Guardians reports having received a letter from the L.G.B. approving generally the guardians' proposal to install electric light at the infirmary.

Lytham.—The B. of T. announces its revocation of the 1907 prov. order.

Mansfield.—At the T.C. meeting last week, Mr. Collins, presenting the report of the Electricity Committee, stated that it was proposed to hand over £600 to the relief of the rates from the profits of the undertaking, in addition to placing a substantial balance to the reserve fund.

Peterborough.—The T.C. has decided to extend the electricity supply along Park Road and to replace the street gas lamps on the section with electric lamps. The city engineer reported a revenue from the electricity supply for the past month of £715 and a surplus of £294.

Rawtenstall.—The Council's electricity department showed a total revenue for the year of £9,145, and after meeting all expenditure there remained a satisfactory surplus of £2,359, which it is proposed to place to renewals. During the year 1,498,000 units were generated, as compared with 864,000 in the previous year.

Rochdale.—It was reported at the meeting of the Corporation Electricity Committee that two applications had been made by large industrial concerns for supplies of energy amounting to over 2,000,000 units per annum. These applications are for a quantity quite half as large as the present total output of the works for all purposes, and if accepted will call for a substantial increase of generating plant additional to the new plant for which tenders, at an outlay of £8,000, have recently been accepted.

Rothesay.—The T.C. has approved of a scheme of electric light decoration for the esplanade gardens to cost about £800. The scheme includes festoons of fairy lamps for the flower gardens and illumination of the bandstand and enclosure. The Corporation has accepted the offer of the tramway company for the supply of energy.

Salford.—The Electricity Committee has decided to supply Messrs. Norris, Midwood & Co. with energy, subject to the company (1) guaranteeing a minimum consumption of 200,000 units per annum for all purposes, (2) paying an all-round price of ·75d. net per unit for all current consumed, and (3) to the company entering into a five-years agreement. A coal clause is also inserted.

Messrs. J. Mandleberg & Co., whose rubber works are situated in Salford, have appointed Mr. E. M. Lacey as their consulting engineer.

Southampton.—The electrical engineer has been instructed to extend the electricity main from Shirley Road, at an estimated cost of £850. Sanctions have been received from the L.G.B. for permission to borrow £11,600 for generating plant and motors, £5,000 for mains and £3,500 for services; the Board asks the Council to re-consider its application as to borrowing £1,500 for meters and £1,000 for radiators, having regard to the resolution of the Council that meters should be paid out of revenue, and expressing the opinion that this course should also extend to radiators. After September 30th current supplied through slot meters is to be charged at 3½d. per unit and the meter rents discontinued.

Taunton.—The R.D.C. has consented to the T.C. supplying current to premises in the parishes of Taunton St. James's Without, Staplegrove, Norton, Fitzwarren, and Trull.

Tunbridge Wells.—A L.G.B. inquiry was held on April 22nd into the application of the T.C. for a loan of £6,000 for mains extensions. There was no opposition.

TRAMWAY and RAILWAY NOTES.

Blackburn.—The tramways recorded a profit of £276 last year compared with a loss in the previous year of £181. The traffic revenue was £60,283. The number of passengers carried was 11,164,915, and the mileage 1,125,036. Parcel receipts came to £1,995, and the gross income to £63,129. Expenditure included traffic expenses, £14,541; general expenses, £4,755; general repairs and maintenance, £11,295; and power expenses, £10,642. Interest on capital absorbed £5,950, leaving £15,940, out of which £6,022 was devoted to repayment of loans, £8,628 for sinking fund, and £1,000 for permanent way renewal.

Blackpool.—Some interesting figures were submitted to the Tramways Committee, on April 25th, the manager reporting that the profit balance for disposal was not less than £10,053. The tramways receipts totalled £65,340, which is easily a record. The working expenses were £40,234, including £12,889 under the head of general repairs and maintenance. The sum was over £5,500 more than was allowed for in the estimates. Interest on capital amounted to £8,721, and redemption of loans to £6,332, leaving a disposable balance of £10,053. The capital outlay to the end of March was £295,985, sinking fund was £102,855, and reserve fund £11,200.

Cardiff.—The tramway strike was settled on Friday afternoon last, the men deciding to accept the terms of a resolution passed by the Tramways Committee to the effect that the City Council be recommended to grant the nine hours a day and the extra pay demanded by the men for working the Bank Holidays, Good Friday, and Easter Monday, irrespective of the hours worked. It was for this extra pay that the men struck work.

Continental Notes.—France.—A scheme for the construction of an electric tramway in the town of Dieppe is reported to be under consideration.

Germany.—A concession has lately been granted for the construction and working of an electric tramway in the town of Wilhelmshaven (Hanover).

Glasgow.—The General manager has recently reported on a proposal to run an all-night service of cars. He finds that the expense of such a service would be out of all proportion to the traffic, and that it would seriously interfere with the routine repairs, which are carried out at night. The T.C. has remitted back the proposal for further consideration.

Greenock.—The Tramways Committee is considering the question of providing tramway facilities for the upper parts of the town. Railless traction has been suggested, but the Corporation has before it a scheme involving the laying down of rails, and it is to consult with the tramways company on the matter.

Haslingden.—At the meeting of the T.C. on April 25th, Councillor Waddington, in moving the tramways minutes, stated that the next scheme they would consider was that of running railless trolley cars, whereby Helmshore could be made more accessible. He thought that for £4,000 they could put up the equipment and purchase three cars, and thereby develop a growing part of the borough. Other speakers also heartily endorsed the proposal, and the Mayor intimated that the scheme will be considered.

Keighley.—The Tramways Committee of the T.C. is applying to the B. of T. for a further extension of time for the construction of the tramways from Dale Street to Stockbridge, and for the commencement and completion of the lines authorised by the order of 1909.

Lancaster.—The Tramways Committee has had under consideration a scheme for lighting the tramcars with metal instead of carbon lamps, which, it is thought, would result is a considerable saving to the Committee. It was resolved that, as a test, one of the cars be fitted during the summer months with metallic lamps, and that the engineer report further after such experiment.

London.—L.C.C.—The total revenue of the electric tramways for the year ended March 31st last amounted to £2,231,945, and the total tramway revenue to £2,292,301, as compared with £2,175,282 in the previous year. The Highways Committee is at present trying a railless trolley vehicle at Abbey Wood.

Preston.—At the T.C., on April 25th, the chairman of the Tramways Committee, said the receipts during last year amounted to £40,643. It was the first time they had ever reached £40,000. They had carried 9 million passengers, or half a million more than had ever been carried before. The working expenses amounted to £24,008, and the gross profits to £16,635, leaving £6,201 to be carried to the reserve. They had now a gross reserve fund of £31,426. The receipts from the parcel service were £437. This was a gradually growing business, which made a profit sufficient to pay the rent of the new office premises.

Rawtenstall.—The year's working of the tramways shows that 4,669,522 passengers were carried, as compared with 3,286,780 in the previous year. Working expenses amounted to £13,667, while the total expenditure, including financial charges,

amounted to £25,345, or £51 less than the total receipts. The latter amount, together with a rate contribution of £1,500, is to be credited to a renewal fund.

Rotherham.—The report of the tramways manager for the past year shows that, in comparison with the preceding year, the receipts have increased from £33,346 to £35,856, and the number of passengers from 6,960,178 to 7,813,922, while the gross profit was £10,642 as against £8,892. The net profit available for appropriation account is £3,725, as compared with £3,057 last year.

Sutton.—The South Metropolitan Electric Tramways and Lighting Co. has under consideration the establishment of a service of railless cars through Sutton High Street to Belmont. The matter was considered by the U.D.C. at its last meeting on a letter from the secretary of the company, and the Clerk was instructed to reply that the Council was not at present prepared to give it any support.

TELEGRAPH and TELEPHONE NOTES.

Australia.—Approval has been given to the purchase for £1,660 of another wireless outfit from the Maritime Wireless Telegraph Co., for the new station to be erected in the north of Australia to connect with Papua.

In connection with the proceedings which have been instituted by the Marconi Wireless Co. against the Commonwealth, claiming damages for alleged infringement of patent, application has been made to the Chief Justice of the High Court for an order to inspect and examine, through experts, any plant or apparatus erected or to be erected by the Government.

British Gold Coast.—Marconi's Wireless Telegraph Co., Ltd., have contracted to supply and erect a radio-telegraph station at Accra, a port on the Gulf of Guinea about 80 miles east of Cape Coast. The station will be equipped with a 5-KW. set driven by an oil engine. Five masts will be provided, the main mast being 200 ft. in height, and the remaining masts each 60 ft. in height, arranged symmetrically around the main mast. The main aerial will be of the umbrella type, and the second of the twin type. A motor will be driven by a battery of 64 cells, and will drive a disk discharger. The transformer will be designed to afford a transformation ratio of either 300 to 10,000, or 300 to 5,000, as desired. There will also be provided a transmitting jigger and aerial tuning inductance, and the manipulating gear will consist of a Morse hand key actuating an electro-magnetic relay key in the transformer primary circuit. The receiver will be of the standard telephone magnetic detector pattern working in conjunction with the multiple tuner, the combination being capable of syntonising the receiving circuits to all wave lengths between 100 and 2,300 metres. The station will be employed mainly for communication with ships.

France.—The French Government is considering a scheme for the establishment of a system of wireless telegraphy connecting with all the French Colonial possessions. The system would extend from Paris to Timbuctoo in the Sahara, to the Marquises Islands and to Martinique. All the French war vessels are to be equipped with outfits, and it is expected that all the large French steamship companies will follow the example.

Morocco.—A system of telegraphs is being established in Morocco, and it is stated that the Sultan is about to grant a concession for the erection and working of telephone exchanges giving communication between the principal towns.

New Cables.—The Portuguese Government proposes to lay two new submarine cables, one from Horta Azores to North America, and the other to Europe.

Panama Canal.—The U.S. Government has commissioned Major G. O. Squier to visit the Panama Canal zone and select sites for five local wireless stations, as well as for a high-power station. Major Squier will also represent the United States at the International Wireless Convention in London.

Underground Telegraph Cables.—From a recent statement by the P.M.G., it appears that the telegraph cable between Newcastle and Middlesbrough has proved unsatisfactory in use, and that it has not been possible to rely upon it for the main service.

Wireless Telegraph Patents.—The shares of the High-Frequency Machine Co., of Berlin, are at present the object of speculation on the Berlin Stock Exchange, owing to expected developments in wireless telegraphy, the price having fluctuated between 140 per cent. and 200 per cent. since the disaster to the *Titanic*. The company owns the foreign patents of the high-frequency generator devised by Prof. R. Goldschmidt, of Darmstadt, but does not manufacture on its own account, as the plant of the Lorenz Co., with which it is closely associated, is utilised for practical work. Negotiations for the sale of foreign patents have been proceeding for some time past, although it does not appear that the Marconi Co. is concerned with the matter. The High-Frequency Co. has just made a call upon the 75 per cent. unpaid share capital for the purpose of defraying the cost of further experiments. It is intended to erect a station near Berlin, on the one hand, and one in the United States, on the other, and to equip them with high-frequency generators.

Wireless Telegraphy at Sea.—It is stated that since the beginning of 1909, that is during a period of three years, the passengers on no fewer than 22 shipwrecked vessels have owed their lives to the fact that the ships were equipped with a wireless telegraph system, and were consequently able to send out messages for assistance.

Wireless Telegraphy in German Colonies.—Some information concerning wireless telegraphy with and in German Colonies was recently given by Count Arco, director of the Berlin Wireless Telegraph Co., before a meeting of the Technical Committee of the German Colonial Economic Committee. It was mentioned that in order to carry out trials, a receiving station with a large antenna was erected at Togo, and the station at Nauen, near Berlin, was considerably enlarged. The trials began at the opening of the present year, and were in progress at the time the Nauen station was blown down. The Minister of Posts and Telegraphs stated previously to the disaster that it had been possible to receive at Togo a portion of the messages transmitted from the Nauen station. The Duala station in the Cameroons has been completed to the order of the Imperial Post Office authorities, the principal object of which is to establish communication with ships passing at great distances. The telegrams from Duala are received with great facility at the Togo station, which is 620 miles distant. In South-West Africa two smaller stations—one at Luderitz Bay and one at Swakopmund—have been erected for communication with passing vessels and for mutual exchange day and night. The latter is finished, and fully meets the requirements, but the former is awaiting the arrival of a generator, and has, therefore, not yet been used as a transmitting station. It is possible at times, under favourable conditions, to receive signals at Swakopmund at night, even from the Duala station, which is 1,860 miles distant. A constant service has been maintained for a long time past between both stations on the Victoria Nyanza, in East Africa. It is now proposed to connect the South Sea colonies by the erection of stations at Yap, Rabaul, Nauru and Apia.

CONTRACTS OPEN and CLOSED.

OPEN.

Ashton-in-Makerfield. — May 14th. The U.D.C. is inviting tenders for Contract 5.—10 centrifugal pumps and motors for driving the same, and 11 other motors for driving sundry machinery. Contract 6.—Overhead electric power cables from Gerard Street to the pumping station and disposal works, also switchboards and power wiring, and electric lighting wiring and accessories. Specifications and forms of tender, £1 (returnable), from the engineers, Banks, Fairclough & Stephen, Leigh, Lancs.

Australia.—Victoria.—May 8th. Cable for P.M.G.'s Department.

June 4th.—1,000 protectors, galvanised iron wire, galvanised steel wire and sleeves, for the P.M.G.'s Department. See "Official Notices" April 19th.

June 11th.—Electric incandescent lamps, illuminating and switchboard, and silk-covered wire, for the P.M.G.'s Department See "Official Notices" April 26th.

Deputy P.M.G., Melbourne.—June 4th. 259,500 porcelain and earthenware insulators and batteries.—June 11th. 9½ miles of telephone switchboard cable; 1,000,000 paper jointing sleeves; and 252 tons of sulphate of copper.—Apply, High Commissioner in London for Australian Commonwealth.

June 18th.—50½ miles of cable, for the P.M.G.'s Department. See "Official Notices" to-day.

P.M.G., Melbourne.—July 23rd. Nine sections of a lamp-signalling trunk-line switchboard. See "Official Notices" April 5th.

A notice appears in our advertisement columns to the effect that the Agent-General for Victoria is prepared to receive tenders for certain works in connection with the electrification of the Melbourne suburban railways. The tenders now invited, we understand, will cover plant for the equipment for electrical working of about 300 miles of single track, including the construction of a generating station of a capacity of 60,000 KW., substations for supplying current to the trains, and the electrical equipment for a large amount of rolling-stock; each part of the work may be tendered for separately. Tenderers may submit proposals for the supply of either continuous-current equipments or single-phase equipments; and in the case of the power station, tenders may be submitted for turbo-alternators of either 10,000 KW. or 20,000 KW. capacity each. The Victorian Government have arranged with Mr. Charles H. Merz, the consulting engineer for the work, to leave England as soon as the tenders have been received, in order to advise them in connection with the placing of orders for the different works.

Tasmania.—June 10th. Telegraph and telephone material, for the P.M.G.'s Department. See "Official Notices" April 12th.

Barlborough (near Chesterfield).—Tramway, railway siding, &c. Mr. C. Robinson, Westfield Lodge, Barlborough.

Birkenhead.—May 27th. Electric light installation at the Union Workhouse, Tranmere, for the B. of G. See "Official Notices" April 26th.

Bray (Ireland).—May 7th. One 150-B.H.P. Diesel engine, coupled to a 100-KW. alternator and exciter, and one 7½-ton overhead crane, for the U.D.C. See "Official Notices" April 12th.

Brighton.—The Corporation is about to invite tenders for electric lamp requirements for a year—about 4,500. Each lamp will have to be marked "Brighton Corporation."

Bristol.—May 6th. One 1,000-KW. three-phase to D.C. converter, for the Corporation (British manufacture preferred). See "Official Notices" April 26th.

Constantinople.—June 15th. Tenders are invited for the establishment of electric tramways in the Asiatic part of the capital. Particulars, in French, from the Minister of Public Works on forwarding the equivalent of 10s. in Turkish money (half of £T).

Derby.—One water-tube boiler, for the Corporation Electricity Department. See "Official Notices" to-day.

Dewsbury.—The Corporation Electricity and Tramways Committee is inviting tenders for renewal of economiser at Bradford Road Electricity Works. Specifications and forms of tender, £1 1s. (returnable), from Mr. R. H. Campion, engineer.

Dublin.—May 8th. The Corporation Technical Education Committee is inviting tenders for various mechanical and electrical machinery for the technical school. Specifications from the secretary, Mr. L. E. O. Carrell, Lower Kelvin Street, Dublin.

Edinburgh.—The Corporation invites tenders for the electric lighting installation at the Clydesdale Bank, Royal Exchange. Mr. F. A. Newington, Corporation engineer.

Falkirk.—May 6th. Stores for a year, for the Burgh Electricity Department. See "Official Notices" April 19th.

France.—June 5th. The French Post and Telegraph authorities in Paris (103, Rue de Grenelle) are inviting tenders for the supply of a multiple telephone switchboard for the Telephone Exchange at Roubaix.

Glasgow.—May 10th. Sub-station switchgear, for the Corporation Electricity Department. See "Official Notices" April 26th.

Gloucester.—Forty-five street-lighting lanterns for high candle-power tungsten lamps, for the City Electricity Department. See "Official Notices" to-day.

Grimsby.—May 16th. Continuous-current motor-generator with switchboard panel, and an automatic reversible booster with switchgear, for the Corporation. See "Official Notices" April 26th.

Halifax.—May 13th. One 360-tube fuel economiser, for the Corporation Tramways and Electricity Committee. See "Official Notices" to-day.

Heston and Isleworth.—May 8th. 500-KW. steam engine, D.C. generator, balancer, &c., water-tube boiler, chain-grate stoker, pipework, &c., surface condenser, air pump, &c., for the U.D.C. See "Official Notices" April 19th.

Hoylake and West Kirby.—May 6th. One Lancashire boiler, with superheater, &c., vertical steam pump and self-acting re-starting injector, for the U.D.C. Electricity Works. See "Official Notices" April 19th.

Huddersfield.—May 20th. 1,000 single-phase meters, for the Corporation. See "Official Notices" to-day.

Kimberworth.—May 16th. Electrical wiring at the Smallpox hospital, for Rotherham T.C. Borough Engineer.

Leicester.—May 17th. One 750-KW. single-phase motor-alternator, for the Corporation Tramways and Electricity Department. See "Official Notices" to-day.

Leigh.—May 13th. Telephone installation at the Union Workhouse, for the B. of G. See "Official Notices" to-day.

Lincoln.—May 6th. One 1,000-H.P. Diesel oil engine, coupled to a continuous-current dynamo, or two 500-H.P. Diesel engines, with continuous-current dynamos; one 120-KW. motor-generator and one switchboard, for the Corporation. See "Official Notices" April 12th.

London.—HACKNEY.—May 9th. High and low-tension cables, boxes, frames and covers, troughing, ducts, &c., for the B.C. Electricity Department. See "Official Notices" April 19th.

L.C.C.—May 8th. Electrical installation at the Malmesbury Road Central School. See "Official Notices" April 26th.

Manchester.—May 14th. The Corporation Tramways Department is inviting tenders for (*a*) tramway rail bonds (*b*) hard-drawn copper trolley wire (*c*) steel tramway poles (*d*) span wire, brackets. Specifications and forms of tender (*c*) and (*d*), £1 1s. (returnable), from Mr. J. M. McElroy, general manager.

May 8th.—Electrically-driven boiler feed pump. Specifications and forms of tender from Mr. F. E. Hughes, secretary, Electricity Department, Town Hall

Newcastle-on-Tyne.—May 22nd. Turbo-alternator and converting plant, for the Tramways Committee. See "Official Notices" April 26th.

Newcastle-under-Lyme.—Extensions and alterations to switchboard, for the Corporation. See "Official Notices" April 26th.

New Zealand.—July 1st. Public Works Department. Supply of machinery and material for the Lake Coleridge electric power scheme. See this column in our issue of April 12th.

Nuneaton.—May 14th. Main switchboard, for the Corporation Electricity Department. See "Official Notices" to-day.

Pembroke.—May 8th. Extension of existing 1,500-ampere-hour battery, for the U.D.C. Electricity Department. Clerk, Town Hall, Ballsbridge, Co. Dublin.

Rotherham.—May 18th. Two automatically-controlled electrically-driven motor and pump sets, each set to be capable of raising 100 gallons per minute against a head of about 60 ft., for the T.C. Borough Engineer.

Walthamstow.—Tenders are to be invited for doubling the tramway track at Bell Junction.

West Ham.—June 5th. Refuse destructor and steam-raising plant in connection with the Canning Town generating station, for the Council. Specification (£1, returnable) from the Borough Engineer, Town Hall.

CLOSED.

Batley.—The tender of Messrs. N. Hainsworth, Ltd., Batley and Dewsbury, amounting to £224, for electrical work in connection with the extension of the Boys' Grammar School, has been accepted.

Belfast.—On a report from the electrical engineer regarding the tenders for the supplying of two 750-KW. turbo-alternators and condensing plant, it was decided to accept the tender of Messrs. Richardsons, Westgarth.

Bolton.—The contract for the steel work for the battery and booster house at the Electricity Works has been secured by Messrs. John Booth & Sons.

Bridlington.—The T.C. has accepted the tender of Messrs. Ledward & Beckett, Ltd., for the extension of the condenser at the Electricity Works, at £1,425.

Constantinople.—The Constantinople Telephone Co. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for supplying and laying telephone cables and conduits. The value of the contract approximates £100,000.

Croydon.—The Council has placed a contract for electric cables for a year with Messrs. Callender's Cable and Construction Co., Ltd., and has also accepted the tender of the British Westinghouse Electric Co., Ltd., for the supply of A.C. meters for the ensuing 12 months.

Derby.—The E.L. Committee of the T.C. has accepted the tender of Messrs. F. W. Brackers & Co., Ltd., for condensing water screens, at £278.

Glasgow.—The T.C. Tramways Committee has accepted the following offers:—

Mica.—Micanite and Insulators Co., Ltd.; British Mica Co., Ltd.
Copper contacts for H.T. breakers.—British Westinghouse Electric Co., Ltd.
Collector brushes for rotaries.—Estler Bros.
Wood paving blocks.—Millars' Karri & Jarrah Co., Ltd.
Peacock brakes.—W. C. Yuille & Co., Ltd.
Toocam brake attachments.—Dryers, Ltd.
Copper rail-bonds.—United States Steel Products Co.

Gravesend.—The T.C. has accepted the tenders of Messrs. Ferranti, Ltd., and the Electrical Apparatus Co., for ordinary house meters; and those of Messrs. Ferranti, Ltd., and the Electrical Co., for two-rate meters.

Halifax.—The Electricity Committee has accepted the following tenders:—

Worthington Pump Co., Ltd.—Worthington condenser and pump, £3,054.
British Thomson-Houston Co., Ltd.—Turbo-alternator, £6,633.

Huddersfield.—The Corporation has accepted the tender of the United Electric Car Co., Ltd., for the supply of six top-deck covers.

Hull.—The Corporation Electricity Committee has accepted the tender of Messrs. S. Heywood & Co. for an overhead crane for the Sculcoates works; and that of the British Westinghouse Electric Co., Ltd., for a new switchboard.

London.—L.C.C.—The Stores and General Committee has accepted tenders for iron castings for permanent way, &c., for the tramways department for one year :—

T. Butlin & Co., Ltd.	£1,155
S. Griffith	217
J. Martin & Son	2,09¼
Summerscales, Ltd.	75

The Highways Committee has accepted the tender of the Lilleshall Co., Ltd., at £7 7s. 6d. per ton, for special rolled-steel bar for magnetic brake shoes (25A and 26A types) :—

	Prices per ton both sections, delivered. Within the specification radius.	At siding.
Lilleshall Co., Ltd.	£7 7 6	£7 7 6
Earl of Dudley's Round Oak Works, Ltd.	7 12 6	7 12 6
Frodingham Iron and Steel Co., Ltd.	7 16 0	7 13 6
P. & W. MacLellan, Ltd.	7 16 3	7 16 3
Cammell, Laird & Co., Ltd.	8 0 0	8 0 0
Henry Bessemer & Co., Ltd.	8 0 0	8 0 0
	25A *Section.*	
Patent Shaft and Axletree Co., Ltd.	8 15 0	8 15 0
	26A *Section.*	
	9 0 0	9 0 0
Bayliss, Jones & Bayliss, Ltd.	9 10 0	9 10 0
The District Iron and Steel Co., Ltd.	9 10 0	9 10 0
George Schultz & Co.	9 16 6	9 13 6

STEPNEY.—In connection with the conversion of the two double-current turbine-driven sets into alternators at Limehouse station, Messrs. A. Reyrolle & Co., Ltd., are to carry out alterations to the high-tension switchgear to accommodate panels for the new generators, at £49 5s. per panel (total £197), and to provide two new power-factor meters for £18, making the total cost £215.

North Riding of Yorks.—The Territorial Force Association has accepted the tender of Messrs. Graham Bros., of Middlesbrough, for aerial telephones on eight ranges, at £20 per range.

Portsmouth.—The B. of G. has accepted the tender of Messrs. Waygoods, Ltd., for two electric lifts for the Infirmary, at £730.

Salford.—The following tenders have been accepted by the T.C. :—

TRIENNIAL SUPPLIES.

W. T. Glover & Co., Ltd.—Paper-insulated single cables (approximate value of contract) £2,100.
Sykes & Sugden.—Joint boxes, £90.
Eckstein, Heap & Co.—Ammeters, £219
G. Bateman & Co.—Arc lamp globes, £35.
Reason Manufacturing Co., Ltd.—Maximum demand indicators, £55.

ANNUAL SUPPLIES.

W. T. Glover & Co., Ltd.—Bare copper wire, fuse wire, and twin flexible.
Aubert, Grenier & Co.—Paper-insulated multiple-core cables, £900.
H. R. Mansfield.—Stoneware pipes and conduits, £250.
Albion Clay Co.—Stoneware pipes and conduits and cable protectors and bearers, £351.
Brush Electrical Engineering Co., Ltd.—Carbon filament glow lamps.
J. H Tucker & Co.—Switches.
General Electric Co., Ltd.—D.C. meters, £264; combined meters and maximum demand indicators, not stated.
Ferranti, Ltd.—A.C. meters, £346.

Siam.—The *Bangkok Daily Mail* contains the following paragraph :—"His Excellency Chow Phya Yomaraj has approved of the decision of the committee (Messrs. F. B. Shaw, E. G. Gollo and A. Odent) appointed to report on the tenders for the Government power station, and the following are the firms whose tenders have been accepted :—A.E.G. (Germany), B.T.-H. (England) and G.E.C. (America), so that it will be seen that the building and plant, when completed, will be quite international in character. The amount of the tender of the amalgamated firms was £54,154. The tender for the Husk conveyors and elevators has not been included in the above, since no tender has been presented which comes within the estimated price. The department should feel much satisfaction in the combination of three such important firms, since, as we understand, each is supplying the section of which it makes a speciality."

Southampton.—The T.C. has accepted the tender of Messrs. Day, Summers & Co., at £65, for the supply of an oil cooler in connection with the turbine at the electricity works.

Stalybridge.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways Board has given a repeat order for six mechanical stokers and self-cleaning furnaces for the generating station, Tame Valley, to Messrs. Ed. Bennis & Co., Ltd.

Walthamstow.—The U.D.C. has accepted the following tenders for annual supplies of stores to the Electricity and Tramways Department :—

W. T. Henley's Telegraph Works Co., Ltd.—Cables, compound for glands, compound tape and jointing metal.
Liverpool Electric Cable Co., Ltd.—India-rubber-covered wires.
Johnson & Phillips, Ltd.—Flexible cords.
Dussek Bitumen Co.—Box compound.
British Electrical Manufacturing Co.—Chatterton's compound, pure rubber tape, soldering fluid and lead fuse-wire.
Siemens Bros. & Co.—White linen tape and resin.
R. W. Blackwell & Co.—P. and B. tape and paint.
Pryke & Palmer.—Plumber's metal and fine solder, petroleum jelly, zinc rods, porous pots, glass jars and salammoniac.
Callender's Cable and Construction Co., Ltd.—Lead sleeves and lead sealing-ends.
Siemens Bros. Dynamo Works, Ltd.—Switches, lampholders and carbons.
General Electric Co.—China bridge fuses and ceiling roses, adaptors and wall plugs, dust shot, steel conduit, &c., key switch-holders, arc lamp hooks, insulated hooks, staples, phosphor-bronze and bell wire, Sinclair insulators, chimney brackets, roof brackets, pole steps and sram lamps.
British Westinghouse Co., Ltd.—Cut-outs and counterweight sets and teak blocks.
Baxter & Caunter, Ltd.—Opal shades, enamelled-iron shades and green-back opal shades.
British Thomson-Houston Co., Ltd.—Teak blocks (recessed) and traction lamps.
Ward & Goldstone.—Tinned-copper fuse wire.
Sloan Electrical Co., Ltd.—Conradty carbons.
Ship Carbons, Ltd.—Carbons for enclosed arcs.
Chamberlain & Hookham, Ltd.—Electricity meters and prepayment meters for pennies and shillings.
Ferranti, Ltd.—Electricity meters and prepayment meters for sixpences.
Electrical Co.—Hour meters and Nernst lamps.
Sunbeam Lamp Co.—Incandescent lamps and Sunbeam lamps.

CAR ACCESSORIES.

British Westinghouse Co., Ltd.—Gear wheels and armature coils.
F. W. Rowlands & Co.—Pinion wheels, trolley heads and trolley-head globes.
W. Wood.—Trolley heads, trolley-head bushes, trolley-head globes, and brass terminals.
Imeson, Finch & Co., Ltd.—Trolley wheels, controller fingers, whipcord and galvanised span-wire.
Brecknell, Munro & Rogers, Ltd.—Rubber sleeves, rubber cap, and trolley booms.
L. Andrew & Co.—Steel wire and trolley cord.
John Baker & Co. (Rotherham), Ltd.—Steel tires.

The following tenders have also been accepted for electrical plant :—

Babcock & Wilcox.—Boiler feed pump and circulating pipes, £3,054.
Richardsons, Westgarth & Co.—Turbo-alternators, £6,390.
Bruce Peebles & Co., Ltd.—Motor-generators, £2,980.
British Westinghouse Co.—Rotary converters, £4,154.
British Thomson-Houston Co.—High-tension switchgear, £1,960.
Crompton & Co., Ltd.—Low-tension switchgear, £529.

Wigan.—The Tramways Committee has accepted the tender of Mr. G. P. Trentham, Handsworth (Staffs.), for the construction of new tramway loops in Wallgate, Scholes, and Station Road.

West Hartlepool.—The T.C. has accepted the following tenders :—

Turbo-alternators.—Richardsons, Westgarth & Co., Ltd.
Rotary converters.—British Westinghouse Co.
Battery.—The Tudor Co.
High-tension switchgear.—Reyrolle & Co.

FORTHCOMING EVENTS.

Institution of Mechanical Engineers.—Friday, May 3rd. At 8 p.m. Discussion to be resumed by Prof. J. O. Arnold on "The Tenth Report to the Alloys Research Committee on the Alloys of Aluminium and Zinc."

Society of Engineers.—Monday, May 6th. At 7.30 p.m. At the I.E.E., London, W.C. Paper on "The Effect of Intermittency in Limiting Electric Traction for City and Suburban Passenger Transport," by Mr. W. Y. Lewis.
Saturday, May 11th.—At 6.30 for 7 p.m. At the Criterion Restaurant, London, W. Annual dinner.

Royal Society of Arts.—Monday, May 6th. At 8 p.m. Howard Lecture on "Heavy Oil Engines," by Capt. H. Riall Sankey. (Lecture II.)

Institution of Electrical Engineers (London).—Thursday, May 9th. At 8 p.m. Papers on "The Behaviour of D.C. Watt-Hour Meters, especially in Relation to Traction Loads," by Messrs. S. W. Melsom and W. H. Eastland; and "Electrical Meters on Variable Loads," by Prof. D. Robertson.
An extraordinary general meeting for Members and Associate Members only will be held, at 7.30 p.m., in connection with the proposed new Articles of Association.

Institution of Electrical Engineers (Dublin Local Section).—Thursday, May 9th. At 8 p.m. Meeting at the New Royal College of Science, Dublin.

Physical Society.—Friday, May 10th. At 8 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "A Method of Measuring Small Inductances," by Mr. S. Butterworth; "The Conversion of Starch into Dextrin by X-rays," by Messrs. H. A. Colwell and S. Russ; "Calibration of Wave-Meters for Radio-Telegraphy," by Prof. G. W. O. Howe; and demonstration of "Apparatus for Showing the Generation of Electricity by Carbon at High Temperatures," by Messrs. J. A. Harker and G. W. C. Kaye.

Junior Institution of Engineers.—Friday, May 10th. At 8 p.m. At the I.E.E. Paper on "Notes on Telephone Exchange Equipment," by Mr. A. J. Hayes.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week :—

Monday, May 6th.—"A" Company. Infantry drill, 7.30 to 8.30 p.m. Technical work, 8.45 to 10 p.m.
Tuesday, May 7th.—"B" Company. Infantry drill, 7.30 to 8.30 p.m. Technical work, 8.45 to 10 p.m. Recruit training for those not passed out by Adjutant, 7.30 to 10 p.m.
Wednesday, May 8th.—All Companies. Annual course of musketry at Purfleet. N.C.O.'s and men leaving Fenchurch Street Station by a later train than 1·48 p.m. will not be able to fire.
Thursday, May 9th.—"C" Company. Infantry drill, 7.30 to 8.30 p.m. Technical work, 8.45 to 10 p.m.
Friday, May 10th.—"D" Company. Infantry drill, 7.30 to 8.30 p.m. Technical work, 8.45 to 10 p.m. Recruit training for those not passed out by Adjutant, 7.30 to 10 p.m.
Saturday, May 11th.—Headquarters will be open for the transaction of regimental business from 10 a.m. till 12 noon.

(Signed) J. H. S. PHILLIPS, Major,
For Officer commanding L.E.E.

Electrical Trades Benevolent Institution.—The meeting was held at the Institution of Electrical Engineers on Wednesday afternoon, for the purpose of confirming the resolution already passed adopting the new rules.

PROPOSED BANKRUPTCY LEGISLATION.

By GEORGE JOHNSON.

The Bill to amend the law with respect to bankruptcy and deeds of arrangement, as introduced into the House of Lords by Lord Granard on December 15th last, proposes to give effect, with some modifications and additions, to the recommendations of the Departmental Committee on Bankruptcy Law and its administration which reported in 1908. It is impossible within the limits of the present sketch to criticise the Bill in detail, but the more important amendments of the law now proposed may be cursorily noticed.

1. Prosecutions for bankruptcy (and Debtors' Act) offences must at present proceed by indictment and be conducted by the Public Prosecutor. Whilst maintaining this procedure for use in the graver cases, it is proposed to give courts of summary jurisdiction power to dispose of these offences, and to enable the Board of Trade to undertake prosecutions before such courts through their solicitor or through the Official Receivers.

2. Commercial offences not now criminal—viz.: (*a*) failure to keep trading accounts; (*b*) failure to explain disappearance of assets; and (*c*) insolvency brought about by gambling.

Such conduct is at present punishable only by refusal or suspension of discharge. The Committee thought these offences should, in the case of bankrupts engaged in trade or business, be made criminal, and as regards (*b*) and (*c*) the Bill follows their recommendation. In regard to (*a*), the Bill makes failure to keep accounts criminally punishable only in the case of a trader who has on a previous occasion been insolvent.

3. After-acquired property of an undischarged bankrupt.—At present all such property is claimable by the trustee in the bankruptcy. Under the Bill (*a*) protection will be given to *bonâ fide* purchases of real (as is now the case with personal) property of this nature, and (*b*) if an undischarged bankrupt again becomes bankrupt, his assets acquired since the earlier bankruptcy will be distributed *pro rata* between the new and the old creditors.

4. All married women engaged in trade are made amenable to bankruptcy proceedings upon a bankruptcy notice following judgment.

5. Marriage settlements.—Additional restrictions are imposed on the power to place property out of reach of creditors in case of bankruptcy by means of covenants in such settlements.

6. General assignments of book debts are to be void against a trustee in bankruptcy unless registered.

It is also proposed to extend the control of the Bankruptcy Courts over foreigners in this country through agents or partners, and to take away the powers of landlords to distrain after bankruptcy for rent payable in advance; whilst Sec. 21 of the Bill is designed to meet the devices sometimes adopted by moneylenders to evade the provision (Sec. 23 Bankruptcy Act, 1890) by which claims for interest in excess of 5 per cent. are to be postponed until all other claims against bankrupt estates have been paid in full.

With regard to the question of the discharge of a bankrupt, it is thought by the promoters that the amendment proposed in the law as to after-acquired property will greatly diminish such commercial danger as at present arises from the existence of a large class of undischarged bankrupts, and that the increased stringency of the disabilities attaching to undischarged bankrupts (which may increase the number of applications for discharge) will afford additional protection to persons having dealings with them.

Part II of the Bill, which deals with deeds of arrangement, is marked by several objectionable features, and unless Secs. 25 and 27 are vitally amended, the conditions sought to be imposed will, in the opinion of the writer, certainly have the effect of legislating deeds of arrangement out of existence. Such also appears to be the opinion of the Parliamentary Committee of the Council of the Society of Incorporated Accountants, which has recently issued a memorandum of the result of its deliberations on the Bill under the name of its able secretary, Mr. James Martin.

NOTES.

New Tests for Insulated Wire.—The *India-rubber World* quotes the revised set of electrical regulations issued in 1911 by the Electrical Department of New York City, which provide that the insulation shall be of rubber or other homogeneous compound which has been approved, and specify a definite thickness for each size of wire. As a protection against too soft an insulation, the rules stipulate certain tests, among which is the following:—The braiding is carefully removed from a portion of the sample, and the copper wire is connected with one terminal of an electric circuit, of which a testing tool forms the other terminal. The portion of the sample from which the braiding has been removed is placed on a flat surface, and the tool edge, which is placed across the sample, is pressed down on to the insulating cover with a pressure of 5 lb., which is maintained for about a quarter of an hour. The electric current, which must be at least 100 volts alternating, is then turned on, and the tool edge must not sink far enough through the insulation to touch the copper wire and complete the electric circuit—a pretty hard test for a small wire, but one to which the best manufacturers have agreed.

A Football Club's German Tour.—We learn that the tour in Germany organised by the Football Section of the Osram and Robertson Electric Lamp Works Social Club proved very successful in every way, and the party returned to London on Thursday, April 11th, thoroughly satisfied with their holiday. Leaving London on Thursday, April 4th, they arrived at Bremen on Friday, where they were billed to play against the Werder F.C. The match was played before an attendance of over 2,000 people, but was, unfortunately, marred by the weather. It rained continuously, and the wind was blowing almost a gale. Under these conditions the play was, of course, of a scrambling nature, and the Werder team won luckily by 3—1. From Bremen the party travelled to Hanover, where they stayed for the night, and started early on Saturday for Berlin. Arriving at Berlin about midday, they were met by representatives of the German Osram Lamp Works, who conducted them to the works, where they were entertained to dinner. After dinner they journeyed to the ground of the Maggi F.C. to fulfil an engagement with them. The weather conditions were the same as at Bremen, but the O. and R. players adapted themselves better to the conditions, and won very comfortably by 6—0. After the match they were the guests of the German Osram Lamp Works Club, who had arranged a dinner, followed by a concert and dance. This programme was thoroughly enjoyed by the party, who, by special request, sang several national songs. When the dancing commenced they had some difficulty with the German dancing, which is much faster than in this country. Their German friends, however, were bent on making the visitors feel thoroughly at home, and soon had things going merrily. Sunday morning was spent in seeing some of the sights of Berlin, and in the afternoon the English club journeyed to the ground of the German Osram Lamp Works Club to play them. This was the most important match of the tour; and as the fine silver cup kindly presented by Director Remané was at stake, the contest was a very keen one. The weather had much improved, and play started in brilliant sunshine. The English club soon scored from a free kick given for a foul, this point causing some discussion, as the Germans were under the impression that a goal could not be scored direct from a free kick. Shortly after this the Englishmen again scored, and held this lead until half time. After changing over they had most of the play, but thanks to the fine play of the German goal-keeper, who was really smart, they could only score once. The German team took their defeat in a fine sporting spirit, and heartily congratulated their visitors on winning the Cup. On Monday morning the party left for Hanover, arriving there about mid-day. They were met by the officials of the Hanover Club, whom they were due to play against in the afternoon. This proved to be the best match of the tour, although the result was a win for the Hanover Club by 4—2. The home team quickly scored twice, and this seemed to encourage the English players to do their very best. Playing a fine combination game the scores were very soon level, but before half-time the Englishmen's left back had the misfortune to put the ball through his own goal. The second half was evenly contested until one of the British backs received a nasty kick on the ankle and had to be carried off. Shortly after this Hanover scored again, their opponent's goal-keeper having no chance with a fine shot. This proved to be the end of the scoring, and Hanover won, as stated. In the evening the O. and R. Club were entertained by the club, who had arranged a concert in their honour. This was thoroughly enjoyed, some of the visiting party singing English songs, much to the amusement of their German friends. After the concert came dancing. Tuesday was spent in sight-seeing in Hanover. On Wednesday an enjoyable morning was spent with some of the Hanover players at the swimming baths. In the afternoon the party entrained for London, the Hanover players turning up in force to give them an enthusiastic send-off. Splendid hospitality was extended to the party everywhere they went, especially by the members of the German Osram Lamp Works Club, who did everything in their power to make the stay in Berlin a thoroughly enjoyable one. The thanks of the Osram and Robertson F.C. are due to Mr. Wilson and director Remané for the generous support they have given the club, and without which the tour could never have been carried through. The club is also indebted to Messrs. Stemmler and Philpot for organising the tour. Result of Matches:—v. Bremen F.C., lost 1-3; v. Maggi F.C., won 6-0; v. German Osram Lamp Works F.C., won 3-0; v. Hannovera F.C., lost 2-4.

Emergency Plant on Steamships.—Referring to the recent disaster to the s.s. *Titanic*, which exemplified the enormous importance of adequate lighting when passengers have to be transferred to the boats, Messrs. Mirrlees, Bickerton & Day, Ltd., write to say that they recently carried out an installation on the new White Star liner *Megantic* on behalf of the White Star Co. and Messrs. Harland & Wolff, having for its object the continuance of the Marconi apparatus, and of a considerable portion of the lights, even after the whole of the steam machinery below has been stopped by an accident. In this scheme a 45-B.H.P. Mirrlees-Diesel oil engine, directly connected to a dynamo, is installed on an upper deck, and from the dynamo a separate circuit is taken round the ship and connected with lights fixed in the main passages, companion ways, saloons, &c. The circuit is also arranged to provide lights in the neighbourhood of the boats, in addition to being connected with the Marconi apparatus.

From the above description it will be seen that in the case of a serious disaster, such as that on the s.s. *Titanic*, a supply of electricity would be continued on board the ship and would give light for the free movement of people about the ship and for the launching of the boats, as well as giving current for the wireless telegraph right up to the moment when the upper deck sank below water.

The installation on the *Megantic* is set at work daily as darkness

approaches and continues running until daylight, quite irrespective of the fact that the steam-driven electrical dynamos are working. This is done so as to avoid any rush or hurry to start up the plant in case of anything happening in the night. An independent plant of this kind could be driven by other forms of engine than the Diesel, but with steam or gas engines the space occupied would be greater, and the handling of coal on an upper deck would cause considerable nuisance. Petrol or paraffin engines might be suitable for the work, but the oils they use would be quite unsafe on board a large ship, and, in fact, are prohibited by Board of Trade regulations. The oil used in the Mirrlees-Diesel engine is cheap residual petroleum.

The arrangement described is of the greatest value, as, with ample light, boats can be much more quickly and safely launched than in darkness or semi-darkness. Also the extended time during which the wireless telegraph apparatus can be worked, in case of accident to the accumulators, gives a greater chance of help being obtained. The fact that the White Star Line has been the first to try this scheme proves its desire to do everything possible to secure the safety of its passengers.

Appointments Vacant.—Commercial assistant, for the Battersea B.C. electricity department (£2 and commission); station superintendent, for the Wakefield Corporation electricity department (£140); chief electrical engineer and manager, for the Hampstead B.C. (£700 and bonus); junior switchboard attendant, for the Corporation electricity works, Lancaster (25s.). See our advertisement pages in this issue.

Institution and Lecture Notes.—The Institute of Metals.—On Friday, May 10th, the Third May lecture of the Institute of Metals will be delivered by Sir J. Alfred Ewing, on "The Inner Structure of Simple Metals," at the Institution of Mechanical Engineers, Westminster, S.W. Cards of invitation admitting to the lecture can be obtained on application to the secretary of the Institute of Metals, Caxton House, Westminster, S.W.

The Concrete Institute.—At a meeting on April 25th, a discussion took place on two reports presented by the Tests Standing Committee of the Concrete Institute, entitled:—(*a*) "The Testing of Concrete, Reinforced Concrete, and Materials Employed Therein:" (*b*) "The Testing of Reinforced Concrete Structures on Completion." The annual general meeting of the Institute will take place at Denison House, Westminster, S.W., on Thursday, May 9th, at 4.30 p.m.

Royal Institution.—The annual meeting was held on May 1st, when the Duke of Northumberland was elected president for the ensuing year, and Sir W. Crookes secretary.

Institution of Civil Engineers.—At the annual general meeting on April 30th, the result of the ballot for the election of officers was declared as follows:—President, Mr. Robert Elliott-Cooper; Vice-Presidents, Mr. A. G. Lyster, M.Eng.; Mr. B. H. Blyth, M.A.; Mr. J. Strain; Mr. G. R. Jebb. The Council has made the following awards for papers read during the session 1911-12: Telford Gold Medals to Messrs. Ernest and Walter Mansergh; a George Stephenson Gold Medal to Mr. Roger T. Smith; a Watt Gold Medal to Mr. A. H. Roberts; Telford Premiums to Messrs. John Goodman, A. B. McDonald, G. Midgley Taylor, D. C. Leitch, W. C. Easton, and D. H. Morton; and the Manby Premium to Mr. S. H. Ellis.

On April 17th Mr. Marconi gave a lecture on wireless telegraphy before the New York Electrical Society, in the Engineering Societies' Building, New York. There were over 1,000 people present, and half as many more were unable to gain admission. The rescue of the survivors from the *Titanic* being fresh in the people's minds, Mr. Marconi had a most enthusiastic reception.

The I.E.E. Articles.—The following letter has come to hand as we go to press. As the matter will probably be settled before our next issue appears, we insert it here:—

"The suggestion given in your issue of April 26th by Mr. Charles C. Garrard has, in my estimation, been timely, and is well worthy of careful consideration by the Institution Council.

"If a higher grade of membership is not at the present time necessary, it will not be long before some such class must be made, unless the existing full membership qualifications are made more stringent.

"One or the other will have to come about, and why not now, while the new Articles are being torn to pieces?

"William T. Taylor.

"(Santiago, Chile, South America.)
"London, W.C., *May 1st*, 1912."

A Damper for the Prevention of Telephone Disturbances.—A Swedish engineer, Mr. Saxenberg, has invented an apparatus to prevent, or, at all events, reduce, buzzing and all such noise which does not concern the conversation. The apparatus is very simple, consisting of a kind of adjustable leak resistance for extra currents on the line in the shape of two columns of water, which are connected with each other and the earth at one end, while the other ends are coupled to the telephone wires. One of these devices is to be inserted at each end of the line, near the telephone apparatus, so as to enable the user of the telephone to reach it, and, by adjusting the one or the other electrode up or down, to cause the buzzing to disappear. By means of its resistance, which is non-inductive, the damper conducts to earth all static charges or induced currents, which take this path in preference to the inductive circuit through the telephone. At the same time, it gives an excellent protection against discharges of electricity from the atmosphere. As both the electrodes can be regulated and the resistances at the poles can thus be varied quite independently of each other, it also becomes possible to compensate for various leakages which may occur in the line. The leakage and the induction vary according to the weather and the atmospheric conditions, and a readjustment of the apparatus accordingly is often necessary so as to obtain the greatest possible "buzz-damping" effect. It is therefore recommended, as mentioned above, to place the apparatus in such a position as to render it easily accessible.

The apparatus has been tested on the line Vesteraas-Traangfors, which was previously nearly useless, and the improvement was astonishing. Previously attempts had been made to obtain the same effect by the installation of an inductance coil between the wires, the centre of which was connected with earth. But such an apparatus has the great disadvantage of offering an inductive resistance, and apart from this there is this drawback, that the two portions are not adjustable in respect of their mutual relation. It therefore does not stand any chance as compared with the adjustable "buzz-damping" apparatus, which is non-inductive, and which is applicable as a remedy against all kinds of ordinary disturbances that are likely to take place. The apparatus has been brought into the market by the Allmäna Svenska Elektriska A/B. —*Teknisk Tidsskrift.*

An Auxiliary Oil-Burning Generating Station.—The growth of electrical service in the Los Angeles district of Southern California has necessitated many enlargements of existing systems of production, transmission and distribution, and conspicuous among the new facilities of the district, the Long Beach oil-burning steam-turbine station of the Southern California Edison Co. stands as a model installation.

The new plant, which has lately been placed in operation as an auxiliary to the existing hydro-electric system of the company, is situated about 25 miles south-west of the city of Los Angeles. The site was selected on account of the availability of condensing water and opportunities for expansion afforded, the possibilities of securing high efficiency of operation far off-setting the moderate transmission required to the centre of distribution. Within a few miles of Long Beach connection is made with the high-tension system of the company by two three-phase 60,000-volt and two three-phase 30,000-volt lines carried on steel towers. The plant is thus available at all times for continuous or temporary service in parallel with the hydro-electric stations of the company, and in the handling of both sudden and sustained peak loads constitutes a valuable insurance against irregularities of service.

The initial service has been initiated with a 15,000-K.V.A. turbo-alternator supplying three-phase, 50-cycle, 11,000-volt current. Eight water-tube boilers supply steam to each turbine and its auxiliary machinery at a pressure of 225 lb. per sq. in. and 125° F. superheat.

The fuel-oil supply for the station is delivered to storage tanks outside the building by gravity from tank trucks, or a neighbouring commercial pipe-line. It is estimated that four truck-loads of oil per day will be consumed by the plant at present, and this fuel will be supplied by the California field.

The storage tanks are made of reinforced concrete and situated 700 ft. from the station, the tops of the tanks being at ground-level. From these main storage tanks the oil is delivered to two auxiliary tanks outside the boiler-room through a 6-in. pipe-line, two triplex pumps driven by 5-H.P. induction motors being required. Each of the auxiliary tanks is fitted with live steam coils for pre-heating, and from these reservoirs the fuel is fed into the furnaces through Hammel burners, two steam pumps being used in this connection. The oil is heated to 130° F. in a feed-water heater, and the combustion is controlled by an automatic regulating system. The heaters are situated in the boiler-room near the base of the chimney, and insure a centralised delivery to the various firing lines. Four burners are installed per boiler, all being at the back of the furnace. Special attention has been given to the problem of securing economical working. A large number of instruments and recorders have been installed which will supply information comparable to that obtained under test conditions, and which will enable any departure from economical operation to be detected with minimum loss of time.

The turbine is of the five-stage Curtis type, running at 750 R.P.M. Oil for the step bearings is furnished by two duplex pumps working at 1,300 lb. per sq. in. on the delivery side. Two 125-KW. 125-volt horizontal turbo-exciters are installed, each exciter being capable of handling two generators. The exciters are worked non-condensing, exhausting into the feed-water heater.

Other interesting features of the station, according to the New York *Electrical World*, include the handling of all electrical output in a separate transformer and switchgear house; the use of auxiliary feed-water heating apparatus with the turbine condensers; use of the base of one chimney as a store-room and lavatory; installation of coloured wiring in connection with the control of oil switches; use of copper tubing instead of bar conductors for bus-bars and connections, and a complete system of oil circulation from motor-driven pumps for transformer cooling.

All the electrical equipment was supplied by the General Electric Co.

Resuscitation from Electric Shock.—The Commission on this subject appointed by the American Medical Association, the National Electric Light Association, and the American Institute of Electrical Engineers, has adopted the Schaefer system as the best method of resuscitation, and is preparing a chart giving details of first aid and describing the method.—*Electrical Review and Western Electrician.*

Remuneration of Auditors.—The general method of remunerating auditors of companies consists of voting them a stated sum for their services. It is, therefore, unusual to observe that, at a recent general meeting of a company, a firm of accountants were re-elected auditors for the ensuing year at the remuneration of 150 guineas in the event of the dividend on the ordinary shares for the year 1912 being less than 5 per cent. with an addition to such sum of 50 guineas in the event of the dividend being 5 per cent. or over. There may be special circumstances in the case, of which we are not aware; but it strikes us as being incongruous to introduce something of a single direction sliding scale in such a matter by apparently endeavouring to harmonise the audit fees with the profits.

Educational Notes.—A special short series of lectures on Rubber, arranged by the Imperial College of Science and Technology, is being delivered at the Royal College of Science by Dr. Philip Schidrowitz, who recently said that a fair proportion of plantation rubber was, in his opinion, already superior to any other rubber produced, not excluding "fine hard" Para, and there was very little doubt that at no very distant date it would replace the latter as the standard of quality. A high-grade rubber had been produced by a chemical process from a very low-grade raw material, namely, Jelutong.

Poor Inventors.—Mr. Bottomley recently asked the President of the Board of Trade whether he would consider the desirability of establishing a department for the purpose of aiding poor inventors in the development and completion of such patents as might, in the opinion of the Board, be of public utility. Mr. Buxton said that under the present practice of the Patent Office all possible help and assistance were given by the staff to every inventor in preparing the specifications and other documents necessary for obtaining patent rights. Having regard to the position of the Crown in granting patents, he did not think it would be practicable or advisable to establish a Government Department with any larger duties in the direction suggested.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements*

Central Station Officials.—The Wakefield Electricity Committee last week recommended the Council to appoint MR. B. HAWKINS, of the Wakefield Corporation Electricity Department, as station superintendent, and MR. H. SIMPSON, of Manchester, was appointed junior shift engineer.

MR. G. P. COSWAY has resigned his position as chief assistant engineer to the Nuneaton Corporation Electric Department, in order to become manager of the Nuneaton Electrical Contracting Co., Ltd.

MR. A. C. BOSTEL, superintendent at the showroom of the Croydon Corporation Electricity Department, has been granted an increase of salary from £169 to £190, rising to £230 per annum.

The Stoke-on-Trent T.C. has appointed MR. FREDERICK WILLIAM LAWTON, of Newcastle-on-Tyne, as mechanical draughtsman in the Electrical Engineer's Department.

MR. G. M. HENDERSON having resigned the position of meter room superintendent at Brighton electricity works, MR. W. KING, his assistant, has been appointed to succeed him, at £156 per annum, rising to £180.

The Bridlington T.C. has appointed MR. FREDERICK FFRENCH, of Kidderminster, as mains assistant.

The Rochdale Tramways Committee has advanced, by £25 per annum, the salary of MR. J. S. D. MOFFET, the tramways manager, who was responsible for planning the Whitworth, Bacup and Milnrow extensions. A further increase of £25 takes effect a year hence.

Tramway Officials.—The staff of the Isle of Thanet Electric Tramways and Lighting Co., Ltd., has presented a golf bag and clubs to MR. J. A. FORDE, manager, as a token of esteem, together with an oak tray for Mrs. Forde.

Preston Corporation Tramway employés met on April 26th to bid farewell to MR. WM. BARKER, an inspector, who is about to leave to take up a position in Western Canada. Mr. Barker was presented with a kit bag, dressing case and pocket-book, and Mrs. Barker was also made the recipient of a dressing case.

General.—MR. V. ZINGLER, for seven years manager of the publicity department of Messrs. Siemens Bros. & Co., Ltd., has been appointed manager of Messrs. Ozonair, Ltd., 96, Victoria Street, Westminster, London, S.W., in succession to MR. R. BORLASE MATTHEWS, Wh.Ex., M.I.E.E., who is joining the General Electric Co., Ltd., 67, Queen Victoria Street, E.C., in order to devote his attention to the promotion of the sale of electric heating and cooking apparatus.

MR. C. J. CATER SCOTT has resigned the chairmanship of the London United Tramways, Ltd., and has retired from the board of directors. He has become chairman of the London General Omnibus Co. MR. W. M. ACWORTH, a director of the London Electric Railway, has been appointed a director of the London United Tramways, Ltd., and will take the office of chairman.

The *Review of the River Plate* says that MR. W. C. LAIDLER, the new manager of the Province of Buenos Ayres Electric Light Co., has arrived to assume his duties.

MR. C. C. POWELL, district electrical engineer of the Southern lines of the London United Tramways, who has been appointed assistant engineer to the Madras Electricity Supply Co., has been presented by his colleagues with a folding pocket camera.

Indian Engineering states that the HON. SIR CHARLES STEWART WILSON has taken over charge of the Indian Telegraph Department from Mr. Dempster, and will now exercise control over both the Post and Telegraph Departments in his new capacity as Director-General of Post and Telegraphs.

According to the *Railway Engineer*, MR. F. E. MILLS, formerly of the Natal Government Railway, has been appointed chief electrical engineer to the Union of South Africa Railways.

MR. M. I. WILLIAMS-ELLIS, consulting electrical engineer, who left Buxton about a year ago for an extended business tour in South Africa, will arrive in England again about the middle of May, when his London address will be the Arundel Hotel.

The marriage recently took place at St. Agnes' Church, Moseley, of MR. HENRY WILLIAM POWELL, only son of Mr. W. H. Powell, of Ashfield Avenue, Moseley, Birmingham, and Miss E. Parfitt, eldest daughter of the late Mr. Louis E. Parfitt, of Ashfield Road, King's Heath.

The marriage took place at St. Andrew's Church, Bruntcliffe, on April 24th, of MR. EDWARD WM. NORRIS, chief electrical engineer on the *Morning Post*, London, and Miss Ethel Maria Wilson, youngest daughter of the late Mr. John Wilson, of Morley.

The following interesting announcement appeared in yesterday's *Daily Telegraph*:—"Wordingham—West.—On April 30th, 1912, at St. John's, Redhill, Surrey, by the Rev. J. W. Crauford Murray, M.A., CHARLES HENRY WORDINGHAM, M.Inst.C.E., to Emily Anne, elder daughter of the late Charles John West, J.P., of Goodwood, Maryboro', Queensland." We tender our hearty congratulations to the Electrical Engineer-in Chief to H.M. Navy.

Obituary.—MR. C. DAY.—The death occurred on April 22nd, after a short illness, of Mr. Chas. Day, for many years superintendent of the overhead wires of the Bolton municipal tramway undertaking. Deceased, who was 42 years of age had had charge of the overhead equipment since the completion of the work.

We regret to announce the death of MR. HINSDELL PARSONS, vice-president of the General Electric Co., of New York. Mr. Parsons met his death in an accident to his automobile near Albany, N.Y., on the 29th ult.

The Edinburgh *Evening Dispatch* states that among the passengers who were lost in the *Titanic* was MR. ROBERT DOUGLAS NORMAN, aged 27 years, who was born at Edinburgh, and who, as part of his education, spent three years at Berlin University. He had resigned his appointment as an electrical and civil engineer under the A.E.G. Co. (Glasgow) in order to pay a visit to a brother in Vancouver, and to make a trip round the world.

It is with a deep and personal regret that we record the death of MR. JOHN GRAY, B.Sc., Examiner at the Patent Office, which occurred on April 28th at his address at Clapham, from pneumonia. We hope to allude to his work in our next issue.

NEW COMPANIES REGISTERED.

Dubilier Electrical Syndicate, Ltd. (121,358).—This company was registered on April 11th, with a capital of £10,000 in £1 shares, to carry on the business indicated by the title, and to adopt an agreement with W. Dubilier. The subscribers (with one share each) are:—L. O. C. Hathaway, 8, Wycliffe Road, Battersea, S.W., clerk; F. C. Parmenter, 48, Upper Richmond Road, S.W., clerk. Private company. Table "A" mainly applies. Registered office, 96-8, Leadenhall Street.

Aberdare Electrical Engineering Co., Ltd. (121,424).—This company was registered on April 16th, with a capital of £1,000 in £1 shares, to take over the business of electrical engineers and contractors for and dealers in electrical apparatus and appliances carried on by A. E. Belsten and B. Lewis, at 27, Victoria Square, Aberdare, Glamorgan, as Ben Lewis & Co. The subscribers (with one share each) are:—A. E. Belsten, 27, Victoria Square, Aberdare, electrical engineer; B. Lewis, 50, Gadlys Road, Aberdare, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are A. E. Belstan and B. Lewis; qualification, £25; remuneration as fixed by the company. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

W. J. Furse & Co., Ltd. (121,420).—This company was registered on April 15th, with a capital of £20,000 in £1 shares, to carry on the business of electrical engineers and contractors, suppliers of electricity, carriers of passengers and goods, manufacturers of and dealers in electric, railway, tramway and other apparatus, &c., and to adopt an agreement with W. J. Furse. The subscribers (with one share each) are:—W. J. Furse, 11, Loughborough Road, West Bridgford, Notts., electrical engineer; W. F. Furse, Holmview, Victoria Embankment, Notts., electrical engineer. Private company. W. J. Furse is permanent governing director, subject to holding £1,000 shares or stock; remuneration as fixed by the company. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Caledonian Telephone (New System) Co., Ltd. (8,219).—This company was registered in Edinburgh on April 17th, with a capital of £2,500 in £1 shares, to carry on the business of fitting up private telephones and telegraphs. The subscribers (with one share each) are:—L. Muller, 62, Robertson Street, Glasgow, merchant; F. J. Jackson, 143-5, Great Portland Street, W. Private company. The number of directors is not to be less than two or more than five; the first are L. Muller and F. J. Jackson; qualification, one share. Registered office, 62, Robertson Street, Glasgow.

British Engineers' Association (the word "Limited" is omitted from the title by licence of the Board of Trade) (121,640).—This company was registered on April 26th, with an unlimited number of members, each liable for £1 in the event of winding up, to protect and promote the general interests of British Manufacturing Engineers, &c. The subscribers are:—C. H. Whittington, Queen Anne's Chambers, Westminster (director, Mather and Platt, Ltd.); P. B. Crowe, Queen Anne's Chambers, Westminster (director, W. H. Allen, Son, & Co., Ltd., Bedford); J. Cunningham Ford, 174, Bedford Hill, Balham, S.W. (director, F. Cooke & Sons, Ltd.); W. Stokes, 32, Victoria Street, Westminster (chairman, Ransomes & Rapier, Ltd.); J. E. Thornycroft, Caxton House, Westminster (managing director, John E. Thornycroft and Co., Ltd.); C. S. Schultz, 63, Pall Mall, S.W. (assistant managing director, Dick, Kerr, & Co., Ltd.); W. McDermott, 3, London Wall Buildings, E.C. (managing director, Fraser & Chalmers, Ltd.); F. R. Davenport, Bennfield, Rugby (managing director, Willans & Robinson, Ltd.); R. S. Lloyd, 99, Queen Victoria Street, E.C. (director, Hayward, Tyler, & Co.); A. H. Smith, Broad Street House, E.C. (London manager, Holman Bros., Ltd.); A. Anderson, Ocean Ironworks, Salford (director, Edward Wood & Co., Ltd.); H. Marsh, 21, Mincing Lane, E.C. (director, George Fletcher & Co., Ltd.); W. Beswick, Parkfield Works, Stockton-on-Tees (general manager, Power Gas Corporation, Ltd.); T. O. Callender, Hamilton House, Victoria Embankment, E.C. (managing director, Callender's Cable and Construction Co., Ltd.); T. C. Stewart, 41, Oswald Street, Glasgow (director, Stewarts & Lloyds, Ltd.); E. Jackson, Midland Works, Birmingham (general manager, Midland Railway Carriage and Wagon Co., Ltd.) The management is vested in a Council, the first members of which are:—C. H. Whittington, P. B. Crowe, J. Cunningham Ford, W. Stokes, J. E. Thornycroft, C. S. Schultz, W. McDermott, F. R. Davenport, R. S. Lloyd, A. H. Smith, A. Anderson, H. Marsh, W. Beswick, T. O. Callender, T. C. Stewart, and E. Jackson. Registered by Cullen & Allingham, 15, Duke Street, St James's, S.W.

Electric Hammers, Ltd. (121,553).—This company was registered on April 22nd, with a capital of £5,000 in £1 shares, to acquire from J. Scott his rights under an agreement between himself and E. J. Faraday, in a patent hammer for chipping steel or other hard substances. The subscribers are:—F. W. Baker Young, 54, Merton Road, Bootle, surveyor, 400 shares; J. Crichton, Huskisson Engine Works, Derby Road, Liverpool, engineer, 300 shares; J. A. Morton, 30, Regent Road, Liverpool, ship cementer, 250 shares; H E. Henderson, Huskisson Engine Works, Derby Road, Liverpool, engineer, 200 shares. Private company. The number of directors is not to be less than two or more than seven: the first are J. Scott, C. J. Faradey, F. W. B. Young, J. Crichton, H. E. Henderson, and J. A. Morton. Registered office, 62, Dale Street, Liverpool.

Walter S. Vaughton, Ltd. (121,545).—This company was registered on April 20th, with a capital of £2,000 in £1 shares, to take over the business of an electrical engineer carried on by W. S. Vaughton, at 38, Barwick Street, Birmingham. The subscribers are:—T. A. Vaughton, Gothic Works, Livery Street, Birmingham, goldsmith, five shares; W. S. Vaughton, 38, Barwick Street, Birmingham, electrical engineer, one share. Private company. The number of directors is not to be less than two or more than five; the first are T. A. Vaughton (chairman), W. S. Vaughton (managing director), and Mrs. E. S. Vaughton. Registered office, 38, Barwick Street, Birmingham.

Hydro-Electric Power and General Trust, Ltd. (121,598).—Registered April 24th, by Linklater, Addison & Brown, 8, Bond Court, Walbrook, E.C. Capital, £500,000 in £5 shares. Objects: To acquire and hold any stocks, bonds, debentures, shares, scrip or other securities of any company established for the purpose of any railway, tramway, gas, water, dock, telegraph, electric lighting or power undertaking. The signatures (with one share each) are:—G. E. A. Waller, 167, Brondesbury Park, Cricklewood, N.W., clerk; G. Dickson, 20, Lovelace Gardens, Southend-on-Sea, clerk; W. J. Simpson, 35, King's Road, Willesden Green, N.W., clerk; E. J. Alldis, 18, Macdonald Road, Forest Gate, E., clerk; J. Coneybeare, 32a, Quinton Street, Earlsfield, S.W., clerk; L. H. Butcher, 52, Gaskarth Road, Balham Hill, S.W., clerk; A. P. Hollinshead, 29, Forthbridge Road, Clapham Common, S.W., clerk. Minimum cash subscription, seven shares. The first directors (to number not less than two or more than seven) are the Earl of Denbigh, Newnham Paddox, Lutterworth; F. T. Bulteel, Plymouth; the Hon. R. V. Grosvenor, 88, Gloucester Place, W.; Sir James Pender, Bart., Donhead House, Salisbury; and A. Elliott, 2, Fenchurch Avenue, E.C.; qualification, £1,000; remuneration, £200 each per annum (chairman, £300) and 5 per cent. of the profits available for distribution in excess of 10 per cent. dividend. Registered office, 3, Frederick's Place, Old Jewry, E.C.

British Union Lamp Works, Ltd. (121,641).—This company was registered on April 26th, with a capital of £20,000 in £10 shares, to carry on the business of manufacturers of and dealers in carbon, metal and other filaments and lamps for electric lighting, suppliers of electric light and power, electricians, &c., to acquire the business carried on by the British Tungsten Lamp Co., Ltd., and to adopt an agreement with T. Griffiths. The subscribers (with one share each) are:—N. R. Stirling, 37, Malling Road, Southport, builder: G. E. Jowett, Yew Tree House, Eccles, Lancs., general merchant. Private company. The number of directors is not to be less than three or more than four; the first are T. Griffiths (chairman) and N. R. Stirling (both permanent, subject to holding 100 shares) and others to be appointed by the subscribers. Registered by T. T. Hull & Son, 22, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Underground Electric Railways Co., of London, Ltd. (73,376).—Trust deed dated April 1st, 1912, to secure £1,400,000 first cumulative income debenture stock, charged on £1,000,000 ordinary stock of the London General Omnibus Co., Ltd., and all further amounts of such stock acquired wholly or partly by this issue. Trustees: Union of London and Smith's Bank, Ltd. Trust deed dated April 1st, 1912 (supplemental to trust deed dated July 30th, 1908), to secure £1,800,000 income bonds, ranking *part passu* with £5,200,000 like bonds at present authorised, charged on £1,000,000 ordinary stock in London General Omnibus Co., Ltd., and other assets specifically charged by trust deed of even date for securing £1,400,000 income debenture stock, subject to such charge, and, as additional security for the whole £6,500,000 income bonds to be issued under said deed of July 30th, 1908, and supplemental deed of April 1st, 1912. Trustees: London County and Westminster Bank, Ltd., Lothbury, E.C.

Hill, Harding & Co., Ltd.—A memorandum of satisfaction in full on March 29th, 1912, of debentures dated June 30th, 1910, securing £100, has been filed. Particulars of £600 debentures, created April 1st, 1912, also filed, pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £150. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Reason Manufacturing Co., Ltd. (64,701).—A memorandum of satisfaction in full on December 29th, of charge dated July 4th, 1911, securing £1,000, has been filed.

"Z" Electric Lamp Manufacturing Co., Ltd. (96,594).—Issue on April 19th, 1912, of £1,100 debentures, part of a series of which particulars have already been filed.

Foreign and Colonial Lighting, Ltd. (99,020).—Charge on company's undertaking, patents, rights and other property, dated April 11th, 1912, to secure £500. Holder: A. B. Reckitt, Kenmore, Highlands, St. Leonards-on-Sea.

British L. M. Ericsson Manufacturing Co., Ltd. (79,061).—A memorandum of satisfaction in full on March 21st, 1912, of debentures dated November 19th, 1908, and October 1st, 1911, securing £70,000, has been filed. Particulars of £100,000 debentures, created April 4th, 1912, and secured by trust deed of even date, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £50,000. Property charged: The company's undertaking and property, present and future, including uncalled capital and freehold hereditaments at Beeston. Trustees: Aktiebolaget Stockholms Handelsbank.

Hendon Electric Supply Co., Ltd. (93,911).—Particulars of debenture stock for an amount not exceeding the subscribed capital, created by resolutions of July 29th, 1907, and March 20th, 1912, and secured by trust deed dated July 30th, 1907, and acknowledgement of indebtedness dated April 2nd, 1912, supplemental thereto, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £8,000. Property charged: The company's undertaking and property, including uncalled capital. Trustees: Beaver Trust, Ltd.

Electromobile Co., Ltd. (75,139).—Issue on April 3rd, 1912, of £161 5s. debentures, part of a series of which particulars have already been filed.

Tramways (M.E.T.) Omnibus Co., Ltd. (119,684).—Trust deed dated March 14th, 1912, to secure £100,000 debenture stock, charged on 19s. per share uncalled on 100,000 £1 shares allotted to the Metropolitan Electric Tramways, Ltd., and company's undertaking and other assets, present and future. Trustees: Electric and General Investment Co., Ltd., 1-2, Great Winchester Street, E.C.

British Columbia Electric Railway Co., Ltd. (51,953).—Return dated December 14th, 1911, filed March 9th, 1912. Capital £4,000,000 in £1,000,000 5 per cent. cumulative perpetual preference stock, £1,000,000 preferred ordinary stock, £1,000,000 deferred ordinary stock and 1,000,000 shares of £1 each. All the 5 per cent. cumulative perpetual preference, preferred ordinary and deferred ordinary stock taken up. £2,800,000 paid. £200,000 deferred stock considered as fully paid. Mortgage and charges, £2,367,613.

C. J. Thursfield & Co., Ltd.—Particulars of £4,000 debentures, created April 1st, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital and book debts. No trustees.

Johnson & Phillips, Ltd. (84,968).—Issue on March 28th, 1912, of 16,000 debentures, part of a series of which particulars have already been filed.

Lobito, Benguella and Catumbella Electric Light and Power Co., Ltd. (107,947).—Trust deed dated March 27th, 1912, to secure £20,000 prior lien debenture stock and having priority in point of undertaking and assets over existing debenture stock, charged on certain premises, and company's other assets, present and future, including uncalled capital. Trustees: Right Hon. Lord Waleran, P.C., 44, Hans Mansions, S.W.; and Right Hon. Lord Rotherham, 61, Queen's Gate, S.W.

Lechlade Electric Light and Power Co., Ltd.—Particulars of £350 debentures, created March 18th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £200. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

CITY NOTES.

British Thomson-Houston Co., Ltd.

THE directors' report covers a period of nine months, from April 1st to December 31st, 1911. This change in the fiscal year was mentioned in the last annual report, as it was considered desirable that the fiscal year should end on December 31st instead of March 31st.

Works at Rugby.—The buildings and machinery of the company have been maintained in first-class condition during the year. A number of extensions were mentioned in the last annual report, the most important being a four-floor building to be utilised as a winding department, and a three-floor extension to the iron foundry. The winding department has been completed; the extension of the iron foundry is approaching completion. The company has recently acquired a tract of land adjoining its Rugby premises, having an area of about 12 acres, and a strip of land 30 ft. wide, lying next to and the full length of the approach to the works, for further extensions as they become necessary, some of which are now being proceeded with.

Works at Coventry.—The company has acquired on lease the premises formerly occupied by Messrs. Humber, Ltd. The necessary alterations are now being made. These works will be used for the manufacture of meters, instruments, and similar apparatus, and it is expected that they will be ready for occupancy in the very near future.

Works at Willesden.—The company has also acquired a tract of land at Willesden on which it is erecting a factory to be used solely for the manufacture of Mazda lamps. The present lamp factory at Rugby will be maintained.

Metallic Filament Lamps.—The advertising campaign in connection with Mazda lamps has been continued, and has been justified by the rapid expansion of lamp sales. The manufacture of the old pressed tungsten filament has been entirely abandoned, and only pure drawn tungsten wire is now used in the manufacture of Mazda lamps, with the most satisfactory results. In last year's report it was stated that the company had acquired premises in Upper Thames Street (adjacent to Cannon Street and Queen Street), in London, which would be known as "Mazda House," and devoted to the sale of lamps and wiring supplies. Unfortunately very

shortly after these premises were opened for business, a disastrous fire occurred, and, although insured, a considerable amount of trouble and loss was caused. The restoration has been completed, and the lamp and wiring supplies department is once more reinstated in these premises.

Curtis Steam Turbines.—The turbine business of the company continues to show satisfactory results, and the largest number of turbines that the company has had on order are now in course of manufacture. The directors can repeat the statement in last year's report to the effect that the shops are full of work, and this has brought about a marked improvement in the company's progress, as will be seen from the balance-sheet. The satisfactory rate of increase in "orders received" has been fully maintained from December 31st last down to the date of this report.

Under the terms of the trust deed securing the issue of the company's debentures, the company had to pay to the trustees on February 28th last the sum of £3,339, to be applied by them in purchasing debentures in the market. Since the closing of the books, debentures of the par value of £3,545 have been purchased, making the total par value of debentures retired to date £17,305. The directors have followed their usual practice in making reserves to cover risks in connection with bad debts, depreciation of shares held by the company, and other contingencies. The balance-sheet, after paying interest on debentures and loans, shows a profit of £23,081 as the result of the nine months' working, and the directors recommend that this should be appropriated as shown in the profit and loss account, leaving a balance of £4,379. This together with the previous year's balance, makes a total amount to be carried forward of £7,382.

Deutsch-Atlantische Telegraphen Gesellschaft.

THE report for 1911 of the German Atlantic Telegraph Co., of Cologne, states that a gratifying increase took place in the Atlantic business, and traffic on the Vigo cable also further developed. The North German Sea Cable Works Co., in which the company holds a large financial interest, had been employed, apart from other orders for cables, in the manufacture of the Monrovia-Pernambuco cable of a length of 2,108 miles, which was laid in a period of 10 days. By the introduction of a new system the speed on the Emden-Vigo cable had been increased by 50 per cent., and it was also intended to use it in connection with the Atlantic cables. Since January 1st, 1912, messages in ordinary language had been accepted at half rates for transmission after fully paid telegrams had been despatched. It was expected that this practice would develop a new kind of business on the part of those who would not otherwise use the cable service The accounts indicate gross receipts of £267,000, as compared with £260,000 in 1910. After meeting general expenses and taxation charges, the sum of £7,500 has been set aside for cable repairs, £29,000 for the cable redemption fund, and £7,400 for depreciation, these contrasting with £5,400, £29,000, and £6,300 respectively in the previous year. Including the balance forward, the net profits amount to £166,000, as against £167,000 in 1910. It is intended to distribute 7½ per cent. on the ordinary capital of £1,200,000, being the same rate as in 1910.

Brisbane Electric Tramways Investment Co., Ltd.—The directors report that the revenue account for 1911, including £3,526 brought forward, shows an available balance of £110,799. After paying debenture stock interest and interim dividends paid on preference and ordinary shares, £67,902 remains. Out of this the directors recommend a balance dividend on the preference shares, £8,828; balance dividend of 4s. per share, free of income-tax, on the ordinary shares, making a cash dividend of 8 per cent. for the year, £15,000; bonus of 10s. per share, free of income-tax, on the ordinary shares, payable in fully-paid ordinary shares, the equivalent of which will be retained for capital purposes, £37,500; carrying forward £6,574. The directors recommend the payment of a further bonus of 10s. per share, free of income-tax, on the ordinary shares out of the reserve fund, to be satisfied by the issue of fully-paid ordinary shares, making, with the bonus of 10s. per share out of revenue, a total bonus of £1 per ordinary share. Thus holders of every five ordinary shares will receive one fully-paid £5 ordinary share, and in cases where holdings are not divisible by five, fractional shares will be sold by the board, and the net proceeds proportionately divided.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors announce a dividend for the quarter ended December, 1911, of 2s. 6d. per share, together with a bonus of 4s. per share (or 2 per cent.), tax free, making a total distribution of 7 per cent. for the year.

British Westinghouse Electric and Manufacturing Co., Ltd.—The report for 1911, issued just as we go to press, shows a trading profit of £126,144. After allowing for depreciation, interest on debentures and debenture stock, &c., there remains a net profit for the year of £20,708, plus £5,117 brought forward. The Lot's Road turbine litigation is now to be carried to the House of Lords by the company.

Great Northern Telegraph Co. of Copenhagen.—The directors have declared a dividend of 12s. per share.

Calcutta Electric Supply Corporation, Ltd.

THE directors' report for the year 1911 shows that the progress of the company continues satisfactory. During the year 10,566,038 units were sold, compared with 8,940,005 units in 1910. The number of houses connected at December 31st last was 6,383, compared with 5,695 at the same date in 1910, an increase of 688, and the equivalent connections in 8 C.P. lamps show an increase of 87,783. The following figures show the comparative results for the past four years:—

Year.	Houses.	Equivalent connections in 8-C.P. lamps.	Units sold.	Gross revenue.	Net revenue.
1908 ..	3,496	378,835	6,765,792	£115,287	£58,188
1909 ..	5,078	452,272	7,856,388	£127,576	£67,024
1910 ..	5,695	528,938	8,940,005	£137,998	£85,597
1911 ..	6,383	616,721	10,566,038	£151,905	£95,597

The profits for 1911 amount to £95,597, which, with the balance brought forward and interest received on money at deposit, makes a total of £102,200. After deducting the interim dividend at the rate of 7 per cent. per annum paid on the ordinary shares in November, 1911, the dividends paid and accrued on the preference shares, and the other items set out in the net revenue account, there remains an available balance of £63,881. The directors recommend that £32,000 be placed to the credit of the depreciation and renewals account; that £3,000 be added to the reserve fund, and that a final dividend be paid on the ordinary shares for the second half-year, at the rate of 10 per cent. per annum, making 8½ per cent. for the year, which will leave £3,289 to be carried forward after providing for the directors' extra remuneration of £2,050. By the above additions the reserve fund will be increased to £84,101, and the reserve for depreciation and renewals to £85,135. The important work of erecting and equipping the high-tension generating station at Cossipore is rapidly approaching completion, and it is expected that the supply from this station will be commenced in July or August next. To provide the money necessary to meet the payments falling due to the several contractors for these extensive works, the board, in November last, offered to the shareholders for subscription the balance of 39,630 preference shares, the whole of which have been taken up, and the issued share capital is now £1,000,000. In order to fill the vacancy caused by the death of the late Mr. Edmund Bulnois, the board have elected Major-General Reginald Henry Mahon, C.B., C.S.I., a director.

Total generated KW.-hours	12,395,138
Kw.-hours sold—public lamps	5,656
To consumers by meter for lighting	3,336,857
To consumers by meter for power	7,228,525
Total sold	10,566,038
Used on works, KW.-hours	712,161
Not accounted for, KW.-hours	1,116,939
Accounted for, KW.-hours	11,278,199
Maximum supply demanded, KW.	4,160

Craigpark Electric Cable Co., Ltd.—The accounts for the year ended March 31st show a net profit of £6,543, which, with the balance of £480 brought forward from last account, makes the sum of £7,024. The directors now recommend the following appropriations, viz.: Depreciation off buildings and machinery, £500; reserve account, £500; dividend (already paid) on 47,500 6 per cent. preference shares, for half-year ending September 30th, 1911, £1,425; ditto for half-year ending March 31st, 1912, £1,425; dividend on 37,500 ordinary shares, at 6 per cent., for the 12 months ending March 31st, 1912, £2,250; cost of new issue of preference shares—one-half of balance, £183; balance carried forward (subject to payment of directors' fees for the past year), £741. The volume of the business in the cable department continues to expand, and although prices have not been quite up to those of last year, there have been corresponding reductions in the prices of the raw material, which have practically equalised matters. Other departments have also yielded average profits, and all are fully employed. Prospects for the current year are highly satisfactory. The stocks have been carefully gone over by the managing director, and are certified by him as being correct.

Cuba Submarine Telegraph Co., Ltd.—The directors' report for the half-year ended December, 1911, states that the total receipts were £18,691, while the expenses amounted to £6,499, leaving £12,191, plus £7,294 brought forward, giving a total of £19,486 to be dealt with. £2,000 has been placed to the reserve against loss on investments, and £2,030 added to the reserve fund, which now stands at £88,000. The dividend on the preference shares will absorb £3,000, and leave £12,456, out of which the directors recommend the payment of a dividend at the rate of 6 per cent. per annum on the ordinary shares, free of income-tax; the balance, £7,656, being carried forward. The main cables have continued in good order throughout the half-year. The new cable between Cienfuegos and Cape Cruz was successfully laid, and is now working in perfect condition.

Prospectus.—*Empire District Electric Co.*—The list was to close last Tuesday in an offer of $1,500,000 first mortgage 5 per cent. sinking fund gold bonds in this American company, at 92½. The company owns the assets of four U.S.A. electric light and power companies, and the capital stock of four other power and gas companies.

City of Buenos Ayres Tramways Co. (1904), Ltd.—The directors have declared a dividend of 1s. 3d. per share, less income-tax, for the quarter ended March 31st.

Neuhausen Aluminium Industry Co.

THE report of the directors of the Aluminium Industrie, A.G., of Neuhausen, states that the unfortunate conditions in the market for aluminium continued during the whole of 1911, and gave occasion to the company to introduce such competitive prices as would assure its position in the world's market. As a consequence the company had secured full employment, although not remunerative, for its works for the whole of 1912. The hope is expressed that this will contribute towards bringing about in the near future of the understanding which is desired by all interested parties. Satisfactory results were realised in the carbide department under the influence of the carbide syndicate, and the experimental plant for the production of nitric acid also worked satisfactorily. The larger installation which had already been completed would be set in operation this spring. An expenditure of nearly £136,000 was incurred in making extensions of the works in the Vallais Canton, and a large outlay was also devoted to the Marseilles works and the goldsmithy. The accounts show the following figures for the two years:—

	1911.	1910.
Paid-up share capital..	£520,000	£520,000
Working profits	182,000	160,000
Depreciation	45,000	44,000
Net profits and balance forward	131,000	138,000
Dividend, per cent.	14	14

During the year the company raised a 4½ per cent. loan of £240,000, thus increasing the loan capital to £439,000.

German Electrical Companies.

The Felten & Guilleaume Carlswerk A.G., of Mulheim, reports net profits of £210,000 for 1911, as compared with £140,000 in the previous year. It is intended to pay a dividend of 6 per cent., as contrasted with 4 per cent. in 1910.

The Kabelwerk Wilhelminenhof A.G., of Berlin, has declared a dividend of 15 per cent. for 1911, being the same rate as in the preceding year. According to the report submitted at the recent meeting, the undertaking was actively employed in all departments. The net profits, after placing £4,300 to depreciation, as against £5,600, amounted to £12,700, as compared with £10,900 in 1910.

The Dr. Paul Meyer A.G., of Berlin, which manufactures electrical measuring instruments and apparatus, reports an increased turnover of 20 per cent. in 1911. After allocating the sum of £6,900 to depreciation, as against £5,500 in 1910, the accounts show net profits of £14,700, as compared with £14,100. A dividend at the rate of 7½ per cent. has been declared on the share capital of £125,000, as contrasted with a similar rate on £100,000 in 1910.

The Sachsenwerk, Licht und Kraft A.G., of Dresden, reports the delivery of 10,040 machines of 108,739 H.P. in 1911, as compared with 7,108 of 75,380 H.P. in the previous year. A number of overland stations were equipped or extended, and the turnover, particularly in Rhineland and Upper Silesia, was almost doubled. After allocating £6,500 to depreciation, as against £5,900 in 1910, the net profits are £21,000, as compared with £10,800, and a dividend of 6 per cent. is proposed on the capital of £212,000, being the same as in 1910.

The Land und Seekablewerke, A.G., of Cologne-Nippes, reports that the works were well employed throughout 1911, although sale prices were not satisfactory in some departments. After apportioning £16,000 to depreciation, as against £5,900 in 1910, the net profits and balance forward are recorded at £30,900, as compared with £17,800 in the previous year. A dividend has been declared at the rate of 9 per cent. on share capital of £262,500, as contrasted with 5 per cent. in 1910. A good stock of orders was brought over into 1912, although sale prices of some manufactures still left something to be desired.

The report of the *Heddernheim Kupferwerke und Suddentsche Kabelwerke, A.G.*, of Frankfort-on-Main, states that the trade contest, especially in the case of copper and brass manufactures, still continued in 1911. In the cable factory overtime frequently had to be worked, but sale prices, particularly for insulated conductors, might have been better. Nevertheless comparatively good results were obtained owing to favourable purchases of materials and an extension of the turnover. After setting aside £16,000 for depreciation, as against £14,000 in 1910, the net profits amount to £44,000, as compared with £39,000 in the previous year. It is proposed to distribute 7 per cent. on the share capital of £450,000, as contrasted with a similar rate on £400,000 in 1910.

The Accumulatoren-Fabrik, A.G., of Berlin and Hagen, which has an ordinary share capital of £400,000, had a turnover of £1,023,000 in 1911, as compared with £892,000 in the previous year, the values representing the combined business of the German and Austrian factories. According to the directors' report, the trade in transportable batteries experienced a further favourable development, and the orders in general in the first quarter of the new financial year showed an increase over the corresponding period in 1911. The accounts indicate gross receipts of £366,000, as against £287,000 in 1910. Depreciation absorbs £17,000, as compared with £12,000, and working and management expenses £196,000, as contrasted with £192,000, the net profit and balance forward being returned at £127,000, as against £82,000 in the preceding year. It is proposed to pay 25 per cent. on the ordinary shares, this comparing with 15 per cent. in 1910, and 12½ per cent. in each of the four previous years. The company's loan of £150,000 is also to be paid off, notice for this purpose having already been given.

The Deutsche Kabelwerke, A.G., of Berlin-Rummelsburg, reports that a further considerable increase in the turnover took place in 1911, although prices left much to be desired. The new capital was not fully employed on productive work. As to the several subsidiary companies, it is mentioned that these were developing satisfactory, and the Union Cable Co., of London, would begin working in its new factory in the course of the present year. The gross profits amounted to £58,000, as compared with £54,000 in 1910. After meeting interest charges, and setting aside £5,800 for depreciation, as against £5,100 in the previous year, the net profits are returned at £24,000, as contrasted with £19,000 in 1910. It is proposed to pay 7 per cent. on the share capital of £262,500, as compared with 8 per cent. on £175,000 in the preceding year. An abundance of orders was brought over into the new financial year, and the sales hitherto have exceeded those in the corresponding period in 1911.

The C. Lorenz, Akt. Ges., which is a telephone and telegraph undertaking, has just declared a dividend of 20 per cent. for 1911, being the same rate as in the preceding year. According to the directors' report, the private orders received were more favourable than in 1910 and resulted in an increased turnover. The orders placed by public authorities were also more numerous, although they did not reach the former level. Sale prices, however, were frequently not very profitable, so that despite the larger volume of business the profits only slightly exceeded those obtained in the previous year. If the company suffered less than other firms in the same branches, the reason was to be found in the considerable turnover in relation to the share capital which amounts to £70,000. The department for wireless telegraphy satisfactorily developed, although the orders were not in proportion to the large expenditure on this branch. After writing off £11,000 for depreciation the accounts showed net profits of £17,000, as compared with £16,000 in 1910.

The report for 1911 of the *Bergmann Elektrizitats Werke, A.G.*, of Berlin, states that the machinery departments were well employed throughout the year, but the various foundry strikes had an unfavourable influence on manufacturing. Nevertheless, a considerably larger number of motors, dynamos and apparatus was delivered than in the previous year. Large orders were received for the new driving plant for ship purposes, and the departments for switchboards, high-tension apparatus and transformer construction experienced a further satisfactory development. In the case of electric railway work good results were recorded, and the construction and performance of the high-speed locomotive delivered to the Prussian State Railways had met with full recognition. The turnover in the lamp department was about on the same level as in 1910, although the sales of carbon-filament lamps slightly declined in favour of wire lamps. The reduction in the prices of metallic-filament lamps in the second half of 1911 had the result of extinguishing the profits in this department. A considerable increase in business occurred in installation materials, and the meter department also yielded favourable results although the decline in prices was only equalised by a larger volume of trade. On the other hand, the turbine and large machinery works were not satisfactory owing to the continuance of underselling. Good results were achieved by the ship turbines made by the licensees, and the Imperial Navy Board was now having a battleship equipped with Bergmann turbines. The metal factory was well employed and the cable factory had a larger turnover, although prices were in part unsatisfactory. It was expected that the motor-car department would produce profits in the new financial year. The volume of business increased from £2,540,000 in 1910 to £3,323,000 last year. After writing down stocks by an extra sum of £60,000, as compared with *nil* in 1910, the accounts exhibit gross profits of £402,000, as against £640,000 in the previous year. General expenses, commission and interest charges, &c., and the allocation of £98,000 to depreciation, as contrasted with £76,000 in 1910, bring the net profits down to £83,000, as against £151,000. It is proposed to distribute 5 per cent. on the share capital of £1,450,000, as compared with 12 per cent. in 1910, and 18 per cent. in each of the four preceding years. The degree of employment in the new financial year has improved, and some departments are realising better sale prices. The company is about to become associated with the Siemens-Schuckert Works Co., which is taking up a large financial interest in the undertaking.

Stock Exchange Notices.—The Committee has (1) appointed special settling days as under:—

Wednesday, May 8th.—British L. M. Ericsson Manufacturing Co., Ltd.—99,990 (cumulative 6 per cent.) preference shares of £1 each fully and partly (10s.) paid, Nos. 100,011 to 200,000.

Underground Electric Railways Co., of London, Ltd.—1,132,357 "A" ordinary shares of 1s. each fully paid, Nos. 1 to 1,132,357; £1,188,974 17s. 6 per cent. first cumulative income debenture stock.

Thursday, May 9th.—Underground Electric Railways Co., of London, Ltd.—£1,188,980 6 per cent. income bonds, Nos. 52,001 to 58,000 of £200, 58,001 to 59,000 of £100, 60,001 to 64,000 of £50, and 64,001 to 78,449 of £20 each.

And (2) ordered the undermentioned securities to be quoted in the Official List:

British L. M. Ericsson Manufacturing Co., Ltd.—99,990 (cumulative 6 per cent.) preference shares of £1 each partly paid, Nos. 100 011 to 200,000.

Mexican Northern Power Co., Ltd.—$4,500,000 5 per cent. first mortgage 30-year gold bonds, in lieu of the scrip.

Rio de Janiero Tramway, Light and Power Co., Ltd.—Further issue of £218,000 5 per cent. 50-year mortgage bonds of £100 each, Nos. B 27,501 to 29,680.

Colombo Electric Trams and Lighting Co., Ltd.—The annual meeting of this company was held in London last week. The directors declared a dividend of 10 per cent., free of tax, for the year 1911, carrying forward £7,447. £11,000 has been transferred to general reserve and renewal fund.

Calcutta Tramways Co., Ltd.

THE annual meeting was held on Wednesday, last week, at 1, Queen Victoria Street, E.C., Mr. E. C. Morgan presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW of April 19th, page 649), said that while the gross receipts in 1911 exceeded those of 1910 by £16,000, the expenses had been greater by £8,000, leaving a net increase in receipts of £8,000. The number of passengers carried had exceeded those carried in 1910 by nearly three millions, and the number of miles run by about 350,000. Notwithstanding this increased mileage, the receipts per car and train-mile exceeded those of 1910, and the actual net increase in receipts indicated the advantage of the larger service, which had become more apparent during the current year. A further amount of £10,439 had been expended on capital account, which consisted almost entirely of cost of new cars and equipment rendered necessary by their expanding business, and as no fresh capital had been raised, this account showed an overspent balance of £37,612, which had been provided by revenue, pending the time when the continued expansion of the business might render the readjustment of the capital account needful. That led him to refer to the alterations which were to take place in Calcutta, due to the creation by Government of a new trust whose business it was to make such changes as they might consider were required by the difficulties which now existed in the housing question in Calcutta. To carry out these improvements they were granted very full powers by Government to open new and convenient thoroughfares, and alter the existing main arteries in the city by realignment and widening where required. The scheme was very comprehensive, and would be costly, but the powers granted to the new trust empowering them to levy certain rates would enable them to get over these difficulties, and to carry out the proposals for vastly improving the condition of the city. They were as yet without any definite information as to when and where the contemplated improvements were to commence, but it was expected that no long time would elapse before a start was made. Speaking generally, he thought he might claim that their efforts had brought about a great improvement in the condition of the company; that its position to-day was better in every way than it ever had been, and that the organisation now established gave reasonable ground for looking forward with confidence to still further improvement. It was at first thought that the removal of the capital of India from Calcutta to Delhi would prejudicially affect their traffic, but it was now generally recognised that this was not likely to be the case, and he believed that the steady improvement in their business would in no way be affected by the change.

SIR HENRY KIMBER, Bart., M.P., in seconding the motion, said that recently he had occasion to be in Calcutta, and he took the opportunity of inspecting the whole of the company's system, including the power houses. He was very much pleased with the latter, and he noted with special pleasure the introduction of the Diesel oil-engine system in the Howrah station. The costs were now being got out of the new system as compared with the cost with the old steam boilers, and he believed it would be found that a very large economy was being effected. Speaking generally the results of the past year had been very satisfactory, and there were signs of improvement even at Howrah, where they had carried 200,000 more passengers than in the previous year.

The report was adopted.

Oriental Telephone and Electric Co., Ltd.

THE annual meeting was held on Wednesday, last week, at the Great Eastern Hotel, E.C., under the presidency of Mr. B. St. John Ackers.

In moving the adoption of the report (see ELECTRICAL REVIEW, page 650), the CHAIRMAN said the result of the year's working had again been satisfactory. The accounts showed a further progress in the revenue, and the amount available for appropriation a further improvement on that of the previous year. They did not recommend a higher dividend than the 8 per cent. distributed during the last five years, as the board wished to see the company becoming financially stronger year by year, bearing in mind the undiminished demand on their capital resources. All their branches had done well during the past year, including the affiliated companies, of which the Bombay and Bengal companies paid higher dividends. He might mention that the Bombay Co.'s shares, which were of the nominal value of 25 rupees, and which two years ago stood at 32, had since risen to their present price of 60 rupees, after having attained an even slightly higher figure. The Bengal Co.'s shares were very firm at par. The negotiations of the Bengal Co. with the Indian Government regarding the acquisition of the latter's telephone system in Calcutta, to which he had made reference on previous occasions, came abruptly to an end last autumn, owing to the Government's decision to transfer the chief seat of the Administration to Delhi, which would naturally entail a very serious reduction of their telephone service in Calcutta. This proposed change of the seat of Government would not, however, apparently interfere with the growth of the Bengal Co.'s general business, which continued to increase unaffected by the change referred to. There might be inducements later on to open a telephone exchange in the new Delhi. The board had already given this possibility their attention, and would not lose sight of it at the proper time. They would have seen the extraordinary resolutions of which notice had been given. The object of the first resolution was to ask their assent to an increase of the board's powers in order to enable them to undertake general business, by altering the memorandum of association to that effect. As stated in the resolution, the enlarged powers were solely and exclusively asked for for the benefit of the Mauritius establishment. Mauritius was a small island with a very busy but small population. The telephone was introduced there many years ago at the time when all their other stations were established. For a long time they found it a very difficult task to make the telephone pay in so small an area, but by perseverance and the efforts of their present excellent manager there, they ultimately made not only both ends meet, but were able to show a small surplus. The concession they secured from the Mauritius Government last year would enable them to extend the telephone business somewhat; but it would, by itself, never yield the proportionate results which they had achieved in other places, nor would it ever support a really first-class manager. For some years past, therefore, they allowed their present manager, a most capable, energetic and cautious man, at his urgent request, tentatively and for small amounts, to sell a variety of English goods which they sent out to him, but which did not come under the definition of electrical appliances, to which their powers at present were restricted. The result of this experiment had been entirely gratifying; and as the telephone profits in Mauritius did not suffice to support a manager such as they would approve of, together with the necessary assistant, they had now to decide whether this new departure was to be continued or not. The object of the second resolution was to make seven the maximum number of directors and four the minimum, instead of the present maximum and minimum of 15 and 5 respectively.

MR. T. LLOYD seconded the motion, and the report was adopted.

The resolutions referred to by the chairman in his speech were then proposed and carried unanimously.

Johnson & Phillips, Ltd.

THE annual meeting was held on Thursday, last week, at Winchester House, E.C., Mr. R. W. Blackwell presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 687), said the trading profit for the year was £18,400, plus £2,154 brought forward, making £20,554 to be dealt with. After providing for the appropriations shown in the profit and loss account, amounting to £19,521, there remained £1,032 to be carried forward. Under the conditions of the debenture deed, the company had now redeemed out of profits £36,162 of its first debentures out of a total issue of £175,000. The onerous conditions of that deed still bore heavily upon them, but he would not again enlarge on the question. During the past year £5,796 had been devoted to the redemption of the first debentures. Since the registration of the company, they had necessarily expended in additions to the manufacturing plant £77,246, and the expenditure last year was £10,501. It was imperatively necessary that they should get modern plant. They had done much in that direction, and more remained to be done. During 1911 they had also expended out of revenue on keeping up the plant and allowing for depreciation, upwards of £9,000. Inasmuch as the original working capital provided at the time of the company's registration was insufficient to meet the demands upon them if they were to properly meet their growing trade the board effected a loan of £24,660 in 1909, and a further loan of £10,000 in 1910. As security for those loans they issued and pledged £50,000 in 5 per cent. second debentures, which issue would have fallen due for repayment next June. He was, however, pleased to say that arrangements had been made so as to enable them to repay those loans and to cancel the issue of the second debentures. A new issue of £50,000 in 5 per cent. second debentures had been made, repayable in 10 years from last October. Of that new issue £30,000 had been issued up to the end of 1911, and since then the remaining £20,000 had been taken up. The net result to the company had been £47,993, which would seem satisfactory. Considerable Press publicity had been given to the new issue without stating that the previous issue had been redeemed, with the result that some shareholders thought the company had been increasing its debenture debt. As regarded the business during the year, the turnover was larger than it had been for several years past. That the profit was less than in the previous year was due to the fact that the trade had been almost entirely in standard goods, on which the margin of profit was comparatively small. The political disturbances in the East, and the unsettled labour conditions, had also adversely affected them. At the present time the orders they had in hand might be considered very satisfactory, especially when they considered the difficulties under which all business had been conducted of late. He was glad to say that the coal strike did not greatly affect them directly, inasmuch as they were prepared to carry on for at least ten weeks as far as fuel was concerned. Indirectly, however, it had suspended many orders which would have been booked, and which he trusted would come later on. They had been favoured by a large and increasing amount of Government orders, and they believed they had filled those orders to the satisfaction of the various departments. He did not expect the shareholders to be enthusiastic over the results. It was, however, his belief that the concern was every year improving its position financially and bringing its plant into more modern and effective condition, thereby preparing itself the better to profit by any substantial and permanent improvement in general business conditions.

MR. THOMAS DENCE seconded the motion, and the report was adopted.

Tramways and General Works Co., Ltd.—The directors have declared a dividend of 1s. per share for the year ended December 31st, carrying forward £151.

Indo-European Telegraph Co., Ltd.

THE meeting of this company was held on Friday last at the offices, 18, Old Broad Street, E.C., Mr. J. Herbert Tritton in the chair.

In moving the adoption of the report (see ELEC. REV., p. 684), the CHAIRMAN said they began 1912 with very flattering prospects as regarded the question of the extension of the company's agreements. For some time past the concession from the Persian Government had been extended to 1945. With regard to the agreement with the Postmaster-General, and the concessions from the German and Russian Governments, it was best that at the moment he should confine himself to saying that negotiations were in each case far advanced, and that they had strong hopes of ultimate success. He took that opportunity of expressing in public his appreciation of the manner in which their representatives had been received by the officials of the Governments with whom they had been in treaty for those extensions. The extension of all their concessions to 1945 would give them a lease of life which would enable them to look some way ahead. There was no doubt that at present they were suffering from a lack of reserve power in their carrying arrangements. If both of their cross-Channel cable wires, and their long connecting landlines to Persia, were in perfect working order, they could get through their daily traffic, much as it had increased during the last 10 years, with satisfaction to their customers and credit to themselves. But if either a cross-Channel cable or any other section of their long and variable landlines was interrupted for even a few hours, they were unable to do justice to the day's traffic. It was, therefore, imperatively necessary to provide an adequate margin of carrying capacity. The directors had hesitated to incur the large expenditure involved whilst the company's existence was liable to be terminated in 1925, but with all their concessions extended to 1945, which they confidently hoped would soon be the case, they proposed first to obtain from the Postmaster-General the lease of an additional, a third, cable wire between England and Germany, and, secondly, to provide an additional landwire from Emden on the German coast to Teheran, by negotiation with the German Government as far as the section through Germany was concerned, and as far as the Russian and Persian sections were concerned by the addition of a wire on the existing poles. The cost of the landline extension would be under £60,000. £35,000 had already been set aside during 1909 and 1910, so it would be a matter of no difficulty whatever from the financial point of view. Their traffics had reached a high level from various causes. The Indian traffic had been heavy, owing, amongst other reasons, to the visit of the King-Emperor and his Consort. South Russian traffic had been fairly well maintained, and the vicissitudes of Persia had brought grist to their mill in the shape of increased telegraphic traffic. Turkish traffic over their direct route to Constantinople was also a satisfactory feature. He would add one word of prudent warning lest shareholders might think that increase upon increase of receipts was in store for them. Telegraph rates showed a perfectly desirable, though to telegraph companies naturally a depressing, tendency to decrease, and owing to the outpayments which they had to make to their concessionary Governments, their margin of profits was not a large one. It was for this reason, and for this reason only, that they were obliged to scrutinise proposed reductions carefully instead of at once accepting them with the alacrity which their good financial position would apparently demand. With a largely diminished margin of profit per word, they would have to carry very heavy traffics to keep up their receipts to their present level; hence the necessity for an additional wire throughout the system. "Deferred," or half-rate, telegrams in plain language were introduced, principally between the British-speaking countries and possessions, in January last. This scheme had now been internationalised to a considerable extent, and was found to meet the needs of those who desired to send a short telegram of a non-urgent character in plain language. Turning to the accounts, the revenue from message receipts showed a gratifying increase of £16,878. The combined commercial and maintenance expenses showed an increase of £5,218, mainly under the maintenance heading, owing to a heavy purchase of telegraph poles and the installations in many stations of accumulators, by which they were replacing their primary batteries wherever possible. The directors had considered it advisable to bring the reserve fund up to £200,000. The amount of £35,000 transferred from profit and loss to this heading accomplishes that object. In respect of depreciation on the company's long list of investments, it had been found necessary to provide only the comparatively small sum of £3,453. The directors now proposed the usual final dividend, absorbing £14,875, and a bonus of 20s. per share, or £17,000, and again recommended a special distribution out of interest upon certain investments and advance accounts of 15s. per share, free of tax in each case, carrying forward £12,144.

MR. CHARLES HOLLAND seconded the motion, which was carried without discussion.

Continental.—GERMANY.—The Schlesische Electricitäts und Gas Gesellschaft, of Breslau, reports a net profit of £76 841 for the last financial year; a dividend of 10 per cent. is being declared, the same as for the preceding 12 months.

BELGIUM.—The Société des Ateliers de Constructions Electriques de Charleroi, which is now giving employment to over 2,300 persons, reports a profit of £35,270 for the past financial year.

Kaministiquia Power Co.—A dividend at the rate of 4 per cent. per annum for the quarter ended April 30th is announced.

Cork Electric Tramways and Lighting Co., Ltd.

THE annual meeting of this company was held at 83, Cannon Street, E.C., on Thursday last week, Mr. S. R. Monks presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 597), said the depreciation reserve had been increased by £6,500, and the amount due to sundry creditors was merely £230 in excess of the figure for 1910. Capital expenditure, after deducting amounts written off house services, wiring consumers' premises, &c., showed a net increase of £3,000. Approximately half of this was for a new 1,000-H.P. boiler, the balance covering house services and cables for the new consumers connected up during the year, and an additional storey to the office buildings. The stores account was rather heavy, as they had a large stock of cables and coal on hand. When the strike was declared they had sufficient coal in the yards to keep the station running at its normal load for fully three months. The item of sundry debtors, £14,749, was heavier than in 1910, but this was the natural result of increased lighting and power business, and they had made ample reserve for bad and doubtful debts. They had invested £8,930 in first-class securities, and, including cash at bankers, £4,475, they had £13,400, which compared with £10,300 at the end of 1910. Turning to the revenue, the traffic receipts showed an increase of £594, as compared with those for the previous year, the revenue per car-mile being 7·02d., as against 6·80d. The exceptionally fine weather no doubt largely accounted for this improvement. The lighting and power branch of the business continued to give satisfactory results, the receipts for the year being £1,086 in excess of those for the previous year, and there were increases also in the other revenue items, which gave them a gross increase in earnings of £1,980. As to expenses they had the large increase of £1,087 for traction expenses. Considerable repairs were carried out on the permanent way, and this item alone was £1,000 in excess of the expenditure for the previous year. They had fitted a number of renewable plates at the joints of the rails on certain sections of the line, and they believed that these plates would add considerably to the life of the rails. During the past two years they had been rebuilding their car bodies. Up to the end of last year they had entirely rebuilt eight bodies, and they would bring in the cars gradually until the whole of the bodies had been rebuilt. Station expenses were £640 less than for the previous year, whilst there were small increases of £302 and £316 respectively for lighting and general expenses. The result of the year's working was a gross profit of £23,853—an increase of £913. After paying debenture interest, preference share dividend, and writing £1,753 off wiring consumers' premises, repair shop equipment, &c., and transferring £6,500 to depreciation reserve—as compared with £5,000 for 1910—the balance allowed of the payment of a dividend of 4 per cent. on the ordinary shares, leaving £1,555 to carry forward. He hoped they would agree that the result was very satisfactory.

MR. H. C. LEVIS seconded the motion, which was adopted.

Lima Light, Power, and Tramways Co.—The directors' report of the Empresas Eléctricas Asociadas states (says the *Financier*) that the accounts show a net profit of £p102,562, which the board has divided as follows:—To reserve fund, £p24,554; shareholders, 4½ per cent., £p60,750; less unpaid, £p30—£p60,719; leaving a balance of £p17,288, out of which the board proposes to pay an additional dividend of 1 per cent. to shareholders in respect of the year 1911, £p13,500; to place to account of unpaid dividends £p30, and to carry forward £p3,757.

STOCKS AND SHARES.

Tuesday Evening.

QUIETER markets are the order of the day in the Stock Exchange. A lull has occurred in the burst of speculative buying, which, as we have hinted once or twice, tended to become unwieldy. It is just as well that a halt should be called in the pace, and although the various rumours upon which the setback is based are none of them particularly credible, they serve a useful purpose in stopping the over-enthusiasm of buyers who could see no end to the bullishness of the markets.

Home Rails, moving with a good deal of irregularity, are, on the whole, inclined to reaction for the time being. The feature since last we wrote has been a violent rise in Metropolitan Consolidated stock, which rushed up the price from 68 to 75 upon the statement that the company was to be included in the Speyer group of Underground undertakings—the stock to be taken over on the basis of 4 per cent. dividend. This was promptly denied by the Speyer group, with the result that Metropolitans went back to 70. But lurking hopes remain that something may be done even yet, and on balance the price shows a substantial rise. Possibly the Great Western may be the ultimate partner. Districts recovered part of the fall which they experienced, and the price has gone up to 47, though this does not represent anything like the highest touched. Many people talk Districts to 50, the calculation being based, of course, purely upon prospects. Underground Electric Railway shares from 4¼ rose to 4⅝, the movement of these being regulated by that in Districts. Underground Electric Income Bonds fell to 89, but recovered to 92; probably they are not over-valued at the present price, in view of the increasing prosperity of the group. City and

South London fell 3 to 39½, and Central Londons are rather easier after their big advances of last week. Rumour continues to play pleasant tunes upon the expectations of what is going to happen to the Central London Railway, the company's name being linked with one after another of the big trunk lines. Great Northern and City Preferred have again given way. The special settlement has been fixed for next week in Underground Electric "A" shares, commonly called 'Bus "A," which touched 17s., reacted to 14s., and at the moment stand at about 15s. middle.

Much of the buoyancy exhibited by these Undergrounds is due to the wonderful traffics being secured by the London General Omnibus Company, the receipts of which go up by leaps and bounds each week. It must be pointed out, however, that the present takings can hardly be regarded as normal, for one of the effects of the coal strike was to drive passengers into the 'buses; and while this factor may remain during the summer time, it can hardly be counted upon to become permanent, in view of the climate enjoyed by London.

Keen excitement in East Londons has resulted in substantial rises in the company's stocks. The Consolidated is up to 11½, and has touched 12½, while the four Debenture stocks stand at 96, 59½, 36½ and 23½ in their respective order. Some speculators prefer the lower-priced Debentures to the Ordinary, as being intrinsically worth more, which of course is the case, but the Ordinary can boast a freedom of market which none of the others possesses.

British Electric Tractions are a shade easier after their recent improvements, the Deferred stock receding to 8½. The 7 per cent. Preferred stock, however, is a point higher. London United Tramways Preference have shot up to 5¼, while the Debenture stock shows a rise of 3, for the reasons upon which we dwelt in our last notes. There is little market in either class, and when the profit-takers come in, the shares, at all events, are likely to experience some reaction.

English Electricity shares are scarcely so firm. St. James's Ordinary and Metropolitan Ordinary gave way a little. The rises in City of London, however, have been continued, and sharp fluctuations are taking place in both Ordinary and Preference Shares. The most conflicting statements are current with regard to the prospects of the company. Some persist that 25 is the least to which the Ordinary shares will rise, and hope to see the Preference standing at 20. The falls to which we have just alluded reflect the other side of the case, and the market in the shares is affected a good deal by the prevailing tone in the Stock Exchange for the time being. Just now a certain amount of liquidation is going on through the markets, and this may have a lot to do with the reaction in the prices. He wants to be behind the scenes who elects to take a hand in the City of London market at the present time. Bournemouth and Poole Ordinary are 15s. higher; there is an important announcement to be made respecting them shortly.

Disturbances in Mexico have little effect upon the quotations for stocks and shares connected with that country. Several of them gave way last week, but the falls are being recovered, and rises are shown by Mexico Trams Common shares and Mexican Light and Power Preference. Monterey lost their small rise of last week. The Canadian group is irregular. While Canadian General Common shares have fallen 3 points, the Preferences are up 1. Shawinigan Debenture rose ½, and Toronto Power Debenture at 101 is also ½ higher. The features, however, are provided by Sao Paulo Trams with a jump of 6 points, and Rio Trams, which have gained 5½, the buying of the latter especially being persistent. Several bond issues show improvements. British Columbia Electric Deferred fell back to 141. Brisbanes continue to improve. The rest of the Indian group remains very steady. La Plata Trams are a trifle down, and Kalgoorlie Preference, now *ex.* dividend, are practically unchanged, allowing for the deduction.

The Telegraph market is still wildly excited over the movements of the Marconi group and National Telephones. The Deferred stock of the latter company has been carried up 5 points this week, following upon its previous rise. Nothing definite is known, of course, as to the figure which will be paid to stockholders as the result of the arbitration in respect of the Government purchase, but the bulls look for something like 180, upon grounds which we have been unable to discover. The Third Preference shares improved to 5⅞. Reuters have fallen back after their sharp rise of last week, some of the holders realising in order to take up the new issue. Great Northern Telegraphs and the Eastern group, as a whole, are steady to good, while there has been some recovery amongst the Anglo-American division.

Marconis, in which there is a too-big bull position, after being 8¾ shed two sovereigns, and the closing price this (Tuesday) night is 7. American Marconi at $2\frac{7}{16}$ compare with 4, to which they were pushed up during the madness of the Friday morning on which they were introduced to the London Stock Exchange market. Canadians receded to 31s., though, in their case, quiet purchases are being made by people who profess to be well informed as to the prospects of the concern. Spanish and General, after being 2½, fell ¼; and, taking the group as a whole, the depression may be explained by a shake-out of some of the weaker brethren who bought more than they should have done, and who have been forced to sell by the drop in prices.

Manufacturing shares show few changes, and what there are are divided fairly equally into rises and falls. Callenders have firmed up, and Telegraph Constructions are £1 higher. The drop of 4 in Edison & Swan First Preference brought in a few buyers, with the result that the price has recovered 2 points. The Babcock shares of each class are rather easier, and in the case of the Ordinary, the explanation is the stock one of profit-taking. Henley's maintain their improvement, and Arons are a firm market.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£	£*		£	£*		Inc.
Aberdeen	April 24	2,701	— 83	47	68,512	+ 3,384	14·4	..
Ayr	„ 27	481	— 75	50	14,454	+ 168	8	..
†Bath	„ 24	861	+ 95	17	12,256	+ 438	14·75	..
Birkenhead	„ 28	2,099	— 118	4	4,208	— 408	13·68	..
Birmingham Corp.	„ 20	20,182	+5,817	8	80,638	+ 6,911	56·4	..
Blackburn	„ 24	2,306	— 707	4⅔	4,985	— 270	14·62	..
Blackpool Corp.	„ 25	1,180	+1,898	..	3,504	— 504	11·87	..
Blackpool-Fleetw'd	„ 27	788	— 612	16	5,559	— 70	8	..
Bournemouth	„ 24	8,622	— 654	38	6,682	+ 940	21·95	..
Bradford	„ 27	10,441	—1,081	4	22,467	— 723	56	1·2
Brighton	„ 28	1,871	— 150	4	3,955	— 77	9·5	..
Bristol	„ 26	13,112	— 528	..	105,807	+10,257	30·5	..
Brit. Elec. Trac. Co.								
Airdrie	„ 19	589	+ 164	16	4,459	+ 1,137	3·65	..
Barnsley	„ 19	278	— 151	„	2,471	— 805	..	..
Barrow	„ 19	734	+ 126	„	5,096	+ 1,316	5·37	..
Devonport	„ 19	1,213	+ 168	„	8,119	+ 1,245	8·35	..
Gateshead	„ 19	1,840	— 251	„	15,610	— 122	11·25	..
Gravesend	„ 19	443	— 52	„	3,136	+ 221	6·5	..
Greenock	„ 19	1,722	+ 267	„	11,555	+ 1,778	7·25	..
Hartlepool	„ 19	517	— 37	„	3,733	+ 281	6·72	..
Kidderminster	„ 19	249	— 33	„	1,491	+ 80	..	..
‡Leamington	„ 19	400	+ 80	„	2,804	+ 144	..	..
Merthyr	„ 19	333	— 187	„	2,812	— 227	2·9	..
Metropolitan	„ 19	18,907	—1,244	„	132,996	+ 8,670	22	..
Middleton	„ 19	745	— 116	„	4,620	— 81	8·5	..
Mid. Joint Com'tee	„ 19	7,322	+ 47	„	57,926	+ 1,731	..	..
Oldham—Ashton	„ 19	1,366	— 81	„	9,028	+ 476	9·18	..
Peterborough	„ 19	251	— 48	„	1,823	+ 165	5·31	..
Potteries	„ 19	3,367	— 819	„	27,583	— 2,323	29	..
Rothesay	„ 19	427	+ 21	„	1,141	+ 105	2·75	..
Southport	„ 19	657	— 64	„	3,895	+ 56	8·17	..
S. Metropolitan	„ 19	2,016	— 102	„	12,022	+ 669	..	..
Swansea	„ 19	2,116	— 340	„	16,927	+ 281	12·5	..
Tynemouth	„ 19	450	— 60	„	2,478	— 29	3·75	..
Weston-s-Mare	„ 19	175	— 89	„	534	+ 7	3	..
‡Worcester	„ 19	664	— 35	„	3,951	+ 107	5·75	..
Wrexham	„ 19	260	— 13	„	1,573	+ 106	..	..
Yorks. Wool. Dist.	„ 19	2,272	— 43	„	16,147	+ 412	17	..
Miscellaneous	„ 19	436	— 61	„	3,239	+ 69	..	..
Burnley	„ 27	2,922	+ 368	..	..	..	11·78	..
Burton-on-Trent	„ 28	510	— 54	4	1,062	— 9	6·6	..
Bury	„ 28	2,641	+ 258	4	5,554	+ 24	22·5	..
†Cardiff	„ 18	2,184	— 125	2	3,886	— 972	17·35	..
Chatham and Dist.	„ 25	1,662	— 317	17	13,268	+ 321	14·9	..
Cork	„ 25	986	— 45	17	7,417	+ 33	9·89	..
Croydon	„ 19	3,956	— 87	3	5,291	— 214	11·6	·75
Darlington	„ 27	391	— 57	4	809	— 12	4·87	..
Darwen	„ 26	589	— 1	4	1,086	+ 9	4·50	..
Dover	„ 20	455	— 71	3	698	— 66	4·75	..
Dublin	„ 26	11,890	— 279	..	91,410	+ 6,685	54·25	..
East Ham	„ 27	2,093	— 96	4	4,195	+ 143	7·87	..
Exeter	„ 26	603	— 121	4	1,178	— 107	5·5	..
Glasgow	„ 27	38,365	+1,282	..	893,661	+46,271	98	·75
Hastings	„ 25	1,482	— 881	..	..	..	19·3	..
Huddersfield	„ 27	3,705	— 535	4	7,601	— 532	29·6	1
Hull	„ 27	5,470	— 345	4	11,161	— 990	13	1·5
Ilkeston	„ 25	160	— 124	4	161	— 364	..	..
Ipswich	„ 27	774	— 123	4	1,490	+ 76	10·5	..
Kilmarnock	„ 20	296	— 11	49	7,883	+ 459	4·25	..
Lancashire United	„ 24	2,593	— 818	17	20,319	— 416	39	..
Leeds	„ 27	14,767	— 270	4	29,214	+ 404	57·5	..
Leicester	„ 27	4,726	— 549	..	..	..	20	..
Leith	„ 27	1,367	+ 188	49½	32,333	+ 3,022	8·72	..
Liverpool	„ 20	23,545	+ 306	15½	183,751	+ 9,812	116	..
‡L.C.C.	„ 17	88,116	— 888	2⅔	106,722	— 128	140·5	2
London United	„ 27	12,457	—2,872	17	97,700	+ 1,735	..	..
Lowestoft	„ 27	254	— 89	80	4,652	— 44	3·5	..
Manchester	„ 27	33,172	+ 656	4	65,778	+ 3,685	105	..
Newcastle	„ 27	7,856	— 793	..	16,407	— 1,410	31·3	..
Newport	„ 20	1,270	— 250	3	1,863	— 479	7·25	..
Oldham	„ 28	4,041	+ 83	5	10,264	— 55	28	..
Pontypridd	„ 27	628	— 396	4	1,289	— 606	5·5	..
Portsmouth	„ 20	4,357	— 342	3	6,422	— 57	15·75	..
Preston	„ 24	1,525	— 68	4	3,092	+ 151	10	..
Rotherham	„ 25	1,282	— 270	3⅓	2,248	— 149	12	..
Salford	„ 29	9,897	— 405	3½	15,918	+ 283	41	..
Sheffield	„ 30	12,476	— 678	5	29,674	— 914	40	..
Southampton	„ 24	2,329	— 94	3	4,166	+ 346	11	..
Southend-on-Sea	„ 24	1,236	— 179	4	2,602	+ 419	7	..
South Shields	„ 27	1,120	— 110	4	2,194	— 142	10·25	..
Swindon	..	..	..	..	..	..	..	..
Tyneside	„ 24	912	— 575	17	7,895	+ 446	11	..
Wallasey	„ 27	2,138	— 151	3⅘	4,285	— 181	8·72	..
Walthamstow	„ 27	1,488	— 194	4	3,125	+ 135	9	..
West Ham	„ 18	5,688	— 137	2½	7,105	— 25	15·25	..
Wolverhampton	„ 24	1,827	— 331	4	3,263	— 58	13·75	..
Cen. London Rly.	„ 27	8,527	—1,159	17	80,685	— 8,973	6·32	..
City & S. Lon. Rly.	„ 18	5 913	— 891	17	54,866	— 3,515	7·26	..
Dublin-Lucan Rly.	„ 26	248	— 66	17	1,978	— 53	7	..
G.N. and City Rly.	„ 27	3,133	+ 154	17	28,380	+ 1,642	3·5	..
L'pool Overh'd Rly.	„ 28	8,152	+ 138	..	25,309	+ 1,5 1	6·6	..
Llandudno-Col. Bay	„ 26	409	— 287	21⅓	3,301	+ 182	6·5	..
Lond. Elec. Ry. Co.	„ 27	26,555	—1,770	17	248,885	+ 8,919	21·25	..
Mersey Railway	„ 27	4.148	— 157	17	34,895	— 184	4·5	..
Metropolitan Rly.	„ 28	32,686	—1,962	17	279,006	— 8,9 1	25·75	..
Met. District Rly.	„ 27	24,588	+ 789	17	219,453	+ 8,821	25	..
Anglo-Argentine	„ 29	102,566	+3,988	..	876,406	+33,711	..	..
§Auckland	„ 5	17,472	+1,098	..	172,044	+13,495	29·9	..
Bombay (B.E.T.)	Mar. 29	6,106	+ 322	13	89,006	+ 2,546	..	..
§Brisbane	Feb.	5,700	—1,975	8	23,784	—13,101	..	..
Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	April 27	7,798	+ 593	..	..	..	..	..
Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	Mar.	3,884	..	3	8,952	..	20·5	..
§Lisbon	..	..	..	..	..	..	..	..
Madras	Mar. 31	1,898	+ 458	..	9,503	+ 647	13·5	·75
§Montevideo	Mar.	31.498	+3 071	5	157,227	+16,407	..	..
Perth (W.A.)	April 26	3 657	+ 148	..	32,133	+ 4,496	29	..

* Compared with the corresponding period of 1911. † One week only.
‡ Includes horse, steam and other receipts. § One month.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations April 30th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord. ..	10	5⅓	5⅓	9 — 10	+ ⅜	5 10 0
Do. 4½ % Pref.	10	4½	4½	8⅜ — 9½	..	4 14 9
Do. Second 6 % Pref. ..	10	6	6	10¼ — 11	..	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	100 —102	..	4 8 8
Brompton & Kensington, Ord...	5	10	10†	8¼ — 8⅜	..	5 14 8
Do. 7 % Cum. Pref.	5	7	7	7⅜ — 8⅛	..	4 6 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	98 —101	..	3 19 8
Charing Cross, West End & City	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅜	..	5 2 10
Do. Do. 4 % Deb... ..	100	4	4	95 — 98	..	4 1 8
Chelsea, Ord.	5	5	5	4¾ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	98 —101	..	4 9 1
City of London, Ord.	10	7	8	20 — 22	+ ½	3 12 9
Do. 6 % Cum. Pref.	10	6	6	16½ — 18½	+ ½	3 4 10
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb. ..	100	4½	4½	101 —104	..	4 6 7
County of Durham, 5 % First Mort. Deb.	Stock	5	5	87 — 89	..	5 12 4
County of London, Ord... ..	10	5	6	10⅝ — 11¼	..	5 6 8
Do. 6 % Pref.	10	6	6	11¼ — 11½	..	5 2 7
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb. ..	Stock	4½	4½	99 —102 xd	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	⅜ — ½	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3 — 3½	..	Nil
Do. 4½ % First Mort. Deb. ..	100	4½	4½	86 — 89	..	5 1 2
Folkestone	5	6	6	4⅜ — 4⅞	..	6 3 1
Do. 5 % Cum. Pref.	5	5	5	4½ — 4⅝	..	5 5 3
Do. 4½ % First Deb.	100	4½	4½	93 — 96	..	4 13 9
Hove	5	9	9	6½ — 7	..	6 8 7
Kensington & Knightsbridge, Ord	5	9	9	7¼ — 7⅜	..	5 16 2
Do. 4 % Deb.	Stock	4	4	92 — 95	..	4 4 3
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	8	2	2½	1⅜ — 2	..	3 14 11
Do. 6 % Pref.	5	6	6	4¼ — 5¼	..	5 14 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	92 — 95	..	4 4 3
Metropolitan	5	5	4†	3⅜ — 4⅜	— ⅛	6 1 3
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅝	..	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	101 —104	..	4 6 7
Do. 3½ % Mort. Deb.	Stock	3½	3½	84 — 87	..	4 0 6
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96 — 98	..	4 11 10
Newcastle-on-Tyne	5	4	4†	3⅜ — 3⅞	..	5 3 3
Do. 5 % Pref., Non-Cum. ..	5	5	5	3¾ — 4⅜	..	5 14 3
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 13 0
Notting Hill, 6 % Non-Cum. Pref.	10	..	6	10¼ — 11¼	..	5 6 8
Oxford	5	7½	7½	5⅞ — 6⅜	..	5 18 9
St. James' and Pall Mall, Ord.	5	10	10	8¼ — 8⅜	— ⅛	5 14 3
Do. 7 % Pref.	5	7	7	6⅜ — 7½	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Smithfield Markets, Ord. ..	5	Nil	2	1⅜ — 1⅞	..	.. ..
South London, Ord.	4	5	5	2⅜ — 3⅛	..	6 8 0
Do. 5 % First Mort. Deb. ..	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref...	1	7	7	1 3/32 — 1 5/32	..	6 1 0
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 11 0
Urban, Ord...	5	5	..	1/4 — 3/4	..	.. ..
Do. 5 % Cum. Pref.	5	5	..	2⅜ — 3¼	..	.. ..
Do. 4½ % First Mort. Deb...	100	4½	4½	86 — 88	..	5 2 3
Westminster, Ord.	5	10	10	8¼ — 9¼	..	5 8 1
Do. 4½ % Cum. Pref... ..	5	4½	4½	5 1/16 — 5 5/16	..	4 4

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅜ — 5⅝	..	5 2 2
Calcutta, Ord.	5	8½	7†	7 — 7⅛	+ ¼	5 13 4
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	93⅛ — 95⅜	+1	5 4 9
Canadian Gen. El. Com. ..	$100	7	7†	113 —117	—3	5 19 8
Do. 7 % Pref.	$100	7	7	118 —122	+1	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	3†	1/8 — 1/8	..	3 4 0
Do. 5 % Deb.	100	5	..	94 — 97	+1	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	93 — 95	..	6 6 4
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	83 — 86	..	5 16 8
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	91½ — 93½	..	5 6 11
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	7/16 — 9/16	..	Nil
Do. 6 % Pref.	1	6	6	31/32 — 1 3/32 xd	—1/32	8 6 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	103 —105	..	4 15 3
Madras, Ord.	5	..	..	2⅛ — 2⅜	..	.. ..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102½ — 105½	..	4 14 9
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	84½ — 86½	— ½	5 15 7
Mexican Lt. & Power, Common	$100	4	4	84 — 86 xd	..	4 13 0
Do. 7 % Cum. Pref.	$100	7	7	104 —106 xd	+2½	6 12 1
Do. 5 % 1st Mort. Gold Bds.	..	5	5	94½ — 96½	..	5 3 8
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	87½ — 89½	— ½	5 11 9
Montreal, Lt., H. and Power ..	$100	7	8	207 —212 xd	+5	3 15 6
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	39 — 41	..	12 3 10
River Plate, Ord.	Stock	10	..	252 —262	..	3 16 4
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	110 —115	..	5 4 4
Do. 5 % Deb. Stock	Do.	5	5	103 —105	..	4 15 3
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital ..	$100	4	5†	137 —141	+1	3 10 11
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	108½ — 110½	..	4 10 6
Do. 4½ % Per. Deb.	Stock	4½	4½	104 —106	+ ½	4 4 11
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	100 —102	+ ½	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92½ — 94½	..	5 5 10
Victoria Falls Power, Pref. ..	1	Nil	11¾d.	⅞ — 1	..	.. ..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	104½ — 106½	..	5 12 8

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	4†	7⅛ — 7⅝	..	.. ..
Do. 5 % Deb. Red.	Stock	5	5	97½ — 99⅜	..	5 0 6
American Telep. & Teleg., Cap.	$100	8	8†	149 —151	+ ½	5 6 0
Do. Collat. Trust	$1000	4	4	94 — 96	..	4 3 4
Anglo-American Telegraph ..	Stock	3½	3	65 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	107½ — 108½	..	5 10 4
Do. Def.	Do.	80/-	80/-	25⅝ — 26⅛	+ ⅛	5 14 3
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —102	+ ⅛	4 17 1
Chili Telephone	5	7	..	7⅛ — 7⅜	+ 3/16	4 10 4
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	83⅛ — 85⅛	— ⅛	4 13 7
Cuba Telegraph	10	6	6†	9⅛ — 10⅜	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3⅛ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	7⅞ — 8⅛	..	6 1 8
Do. 4½ % Debs.	50	4½	4½	99 —101	..	4 9 1
Direct United States Cable ..	10	4½	5	7⅞ — 8 xd	+ ⅛	6 5 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 1
Eastern Telegraph, Ord. Stock	Stock	7	5†	134 —137	..	5 2 2
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	81 — 83	— ⅛	4 4 4
Do. 4 % Mort. Deb.	Do.	4	4	99½ — 101½ xd	..	3 18 10
Eastern Extension	10	7	5†	12⅝ — 13⅛	..	5 5 8
Do. 4 % Deb.	Stock	4	4	98½ — 101½	..	3 18 10
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99 —101	..	3 19 3
Globe Telegraph and Trust ..	10	5⅞	6†	10½ — 11	..	5 9 1
Do. 6 % Pref.	10	6	6	13 — 13½	..	4 9 0
Great Northern Telegraph ..	10	18	18	30⅞ — 31⅞ xd	..	5 9 1
Indo-European Telegraph ..	25	13	5†	58 — 60	+ ½	5 8 4
Mackay Companies Common ..	$100	5	5†	83 — 85	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	70 — 73	..	5 9 7
Marconi's Wireless Telegraph	1	5	..	6 15/16 — 7 1/16	—1	..
Do. 7 % Cum. Partic. Pref.	1	16	..	6⅞ — 6¾	—1⅛	..
Monte Video Telephone, Ord. ..	1	6	6	1 — 1⅛ xd	..	5 6 3
Do. 5 % Pref.	1	5	5	3/8 — 3/4 xd	..	5 10 6
National Telephone, Pref. ..	Stock	6	6†	99½ — 102½	..	5 17 1
Do. Def.	Do.	6	6†	154 —156	+5	3 17 0
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5⅝ — 6	— 1/16	4 3 4
New York Telep., 4½% Gen. Bnds.	100	4½	4½	102½ — 103½	..	4 7 2
Oriental Telep. and Elec. ..	1	8	8	1⅝ — 1¾ xd	..	4 11 5
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅛ xd	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	88⅜ — 90⅜	+ ⅛	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	99½ — 101½	..	3 18 10
Reuter's	8	5	5†	11 — 11⅛	—⅛	3 12 6
Submarine Cables Trust ..	Cert.	6	6	127 —130 xd	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7⅝ — 7⅞	..	5 1 7
Do. 5 % Cum. Pref.	5	5	5	5⅝ — 5⅞	..	4 8 11
West Coast of America	2½	2½	2½	1⅝ — 1⅞	..	3 6 8
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	98 —100	+ ⅛	4 0 0
West India and Panama Teleg.	10	1½	1½†	4 1/16 — 4 5/16	— 1/16	.. ..
Do. 6 % Cum. 1st Pref. ..	10	6	6	10⅜ — 11	..	5 9 1
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9⅝ — 10¼	..	5 17 1
Do. 5 % Debs.	100	5	5	102½ — 104½	..	4 15 8
Western Telegraph, Ltd. ..	10	7	6†	13 — 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	99 —101	..	3 19 3
Western Union Tel., 4% Bnds. A	$1000	4	4	106 —109	..	3 13 5
Do. 4½ % Fdg. Bonds.. ..	$1000	4½	4½	100 —103	..	4 7 5

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations April 30th	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil		..	Nil
Do. 5 % Pref.	1	5	5		..	6 8 0
Do. 4½ % Deb.	100	4½	4½	78 — 83	..	5 8 5
Brit. Elec. Trac., 6 % Pref.	100	..	..	12 — 14	..	..
Do. Do. Deferred	100	..	..	7⅛ — 9½	— ½	..
Do. Do. 6 % Cum. Pr'f.	100	..	6	89 — 91 xd	..	..
Do. 7 % Non-Cum. Pr'f.	100	..	..	39 — 42	+1	..
Do. 5 % Perp. Deb.	100	5	5	93½ — 96½	..	5 3 8
Do. 4½ % 2nd Deb.	100	4½	4½	78 — 82 xd	..	5 9 9
Central London Railway, Ord.	100	3	3	85 — 87	—1	3 9 0
Do. Pref.	100	4	4	87 — 89	..	4 10 0
Do. Def.	100	2	2	88 — 90	—1	2 4 5
Do. 4 % Deb.	100	4	4	101 —103	..	3 17 8
City & South London, Ord.	100	1½	1½	39 — 40	—3	4 1 3
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	103 —105	..	4 15 3
Do. Do. 1901	100	5	5	104 —106	..	4 14 4
Do. Do. 1903	100	5	5	103 —105	..	4 15 3
Do. 4 % Deb.	100	4	4	99 —101 xd	..	3 19 3
Dublin United Trams, 6 % Pref.	10	6	6	10½ — 11½	..	5 2 2
Great Northern & City, Pr'f. Ord	10	Nil	..	2 — 2½	— ⅛	Nil
Hastings Trams, 6 % Pref.	5	Nil	6	⅜ — ½ xd	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	71 — 76	..	5 18 5
sle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅜ — 2⅝	..	4 6 11
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Lancashire United, 5 % Deb.	100	5	5	83 — 85	..	5 17 8
London Elec. Railw'ys, 4 % Deb.	100	4	4	97 — 99	..	4 0 10
London United Trams, 5 % Pref.	10	Nil	..	5 — 5½	+ ¾	..
Do. 4 % Deb.	100	4	4	79 — 82	+3	4 17 7
Metropolitan Railway Consol.	100	1⅞	1⅞	70¾ — 71½	+2¾	2 12 8
Do. Surplus Lands	100	2⅜	2⅞	68 — 70	..	4 3 4
Do. 3½ % Deb.	100	3½	3½	89 — 91	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	86 — 88	..	3 19 7
Do. 3½ % Con. Pref.	100	3½	3½	85 — 87	..	4 0 6
Metropolitan District Ord.	100	Nil	..	46¾ — 47½	+ ½	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Do. 4 % Prior Lien	100	4	4	98 —100 xd	..	4 0 0
Do. 4½ % First Pref.	100	3¾	4½	90 — 92	..	4 17 10
Do. 3½ % Gtd.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan Elec. Trams, Ord.	1	5½	6	⅞ — 1	..	6 0 0
Do. Def.	1	Nil	..	3/32 — 7/32	..	Nil
Do. 5 % Pref.	1	5	5	31/32 — 1 1/32	..	5 10 6
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	97 — 99	..	5 0 0
Potteries, Ord.	1	2	..	1/32 — 3/32	..	..
Do. 5 % Pref.	1	5	5	1⅝ — 1 29/32	..	6 19 3
Do. 4½ % Deb.	100	4½	4½	89 — 92	..	4 17 10
South Metro. Trams, 6 % Pref.	1	6	..	3/32 — 5/32	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 4 0
Underground Elec. Railways	10	..	..	4¼ — 4½	+ ⅛	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1	1½†	91 — 93	..	..
Yorkshire (West Riding), Ord.	5	Nil	..	1/32 — 3/32	..	Nil
Do. 6 % Pref.	5	Nil	..	2¾ — 3¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 84	..	5 7

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½	⅛ — 5/32	..	5 2 4
Do. 2nd Pref.	5	5	5⅛	4/32 — 5/32	..	5 7 4
Do. 4 % Deb.	100	4	4	94 — 95½	..	4 3 9
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	103 —105	..	4 15 3
Auckland Trams, 5 % Deb.	100	5	5	104 —106	..	4 14 4
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 11⅛	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brisbane Trams Invt., Ord.	5	8	8	9⅛ — 9⅜	— ⅛	4 2 1
Do. 5 % Pref.	5	5	5	4/32 — 5/32	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
B. Columbia Elec. Rly., Def.	100	8	8†	139 —143	—1½	5 12 0
Do. Pref. Ord.	100	6	6	126 —129	—1	4 13 0
Do. 5 % Pref.	100	5	5	111 —114	— ½	4 7 9
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98½—101½	..	4 8 8
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	103 —105	..	4 5 9
Calcutta Trams, Ord.	5	6	7	6 — 6¼ xd	..	5 7 8
Do. 5 % Pref.	5	5	5	4 15/16 — 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
Cape Electric Trams	1	Nil	2½†	2/32 — 3/32	..	..
City Buenos Aires Trams (1904)	5	5	5	5⅝ — 5¾	..	4 5 1
Do. 4 % Deb.	100	5	5	101— 103	..	4 17 3
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	92 — 96 xd	..	5 4 2
Havana Elec. Rly., 5 % Bonds	$1000	5	5	101 —104	..	4 16 2
Kalgoorlie Elec. Trams	1	Nil	..	7/32 — 9/32	..	Nil
Do. 5 % A Deb.	100	5	5	91 — 94	..	5 6 5
Do. 6 % B Deb.	100	5	6†	56 — 60	..	10 0 0
La Plata Elec. Trms, Ord.	1	..	..	1/32 — 3/32	— 1/16	..
Do. Pref.	1	6	6	29/32 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1⅛	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	95 — 99	..	5 1 0
Madras Elec. Tr. (1904), Deb.	100	5	5	99 —101	+1	4 19 0
Manaos Trams & Lt., 1st Deb.	100	5	5	93 — 96	..	5 4 2
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½—102½	..	4 17 7
Mexico Trams Com.	$100	7	7	120 —122	+¼	5 14 9
Do. Gen. Con. 5 % Bonds	..	5	5	96 — 98	..	5 2 0
Do. 6 % Bonds	100	6	6	101 —103	..	5 16 6
Para Elec. Rlys. & Lt., Ord.	5	10	10	7⅛ — 7½	+ ⅛	6 13 4
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	7 0 4
Do. 5 % 1st Deb.	100	5	5	101 —103	+ 2	4 17 1
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1 — 1¼	—1/16	2 0 0
Do. 5 % 1st. Deb.	100	5	5	101 —103	..	4 16 2
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 5⅝	..	5 6 8
Do. 4½ % 1st Deb.	100	4½	4½	99 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	127 —129	+5½	3 17 6
Do. 1st Mort. 5 % Bonds	..	5	5	104 —105	— ¼	4 15 3
Do. 5 % Mort. Bonds	100	5	5	97 — 98	— ⅜	5 2 0
Sao Paulo Tram, Lt. and P.	$100	10	10†	213 —216	+6	4 12 7
Do. 5 % 1st Deb.	$500	5	5	104½—106½	..	4 13 11
Singapore Trams, 5 % Deb.	100	5	5	79 — 82	..	5 19 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	6	7	5⅛ — 6	..	6 1 11
Do. 6 % Pref.	5	6	6	5 1/16 — 5 5/16	..	5 12 11
Do. 5 % 1st Deb.	100	5	5	98½—101½ xd	..	4 18 6
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	103 —105	— ½	4 5 9

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	31/32 — 33/32	..	..
Do. 6 % Pref.	1	9	6	6⅞ — 8⅛	..	7 2 2
Babcock & Wilcox	1	26	28	6⅞ — 7⅛	—5	5 0 0
Do. Pref.	1	6	6	1 3/32 — 1 5/32	— 1/16	3 16 10
B.I. & Helsby Cables	5	10	10	6 29/32 — 7 1/32	..	6 18 0
Do. Pref.	5	6	6	5 31/32 — 6 1/32	..	4 16 0
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	91½ — 94½	..	4 15 3
British Westinghouse, Pref.	3	Nil	..	1/32 — 1	..	Nil
Do. Deb.	100	4	4	63 — 66	..	6 1 3
Do. 6 % Prior Lien	100	6	6	99 —102	..	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	2	Nil	..	0 — 1/32	..	Nil
Do. 7 % Pref.	2	Nil	..	0 — 1/32	..	Nil
Do. 4½ % Deb.	100	4½	4½	54 — 59	..	7 10 6
Do. 4½ % Second Deb.	100	4½	4½	37 — 42	..	10 14 4
Callender's Cable	5	15	10†	11 — 11⅜	+ ⅛	6 7 8
Do. Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. Deb.	100	4½	4½	99—101	+ ½	4 9 1
Castner-Kellner	1	17½	20	31/32 — 1 1/32	..	5 6 8
Do. Deb.	100	4½	4½	105 —109	..	4 10 7
Crompton & Co.	3	Nil	Nil	1/32 — 3/32	..	Nil
Do. Deb.	100	5	5	58 — 63	..	7 7 1
Dick, Kerr	1	5	..	31/32 — 1 1/32	..	5 3 1
Do. Pref.	1	6	6	1 1/32 — 1 3/32	..	5 12 11
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A., £8 paid	5	Nil	..	1/32 — 3/32	..	Nil
Do. fully paid	5	Nil	..	1/32 — 2/32	..	Nil
Do. 4 % Deb.	100	4	4	68 — 72	+2	5 11 1
Do. 5 % Second Deb.	100	5	5	75 — 78	..	6 8 2
Electric Construction	2	Nil	2½†	29/32 — 1 1/32	..	..
Do. Pref.	2	7	7	1 29/32 — 1 31/32	..	7 9 4
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8⅛	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	9 — 9½	..	5 5 3
Do. Deb.	100	4	4	85 — 90	..	4 8 11
Henley's, Ord.	5	15	10†	11⅜ — 12⅛	..	6 0 0
Do. Pref.	5	4½	4½	4 13/16 — 5 1/16	..	4 6 9
Do. Deb.	100	4½	4½	104 —106	..	4 4 11
India-Rubber, G. & T.	10	10	..	8⅜ — 9⅛	..	..
Do. Pref.	10	5	5	9⅞ — 10⅛	..	4 17 7
Telegraph Construction	12	20	10†	34 — 36	+ 1	6 13 4
Do. Deb.	100	4	4	99½—101½	..	4 9 0
Willans & Robinson	1	Nil	..	1/32 — 3/32	..	Nil
Do. Pref.	5	Nil	..	1/32 — 1½	..	Nil
Do. Deb.	100	4	4	59 — 61	..	6 11 2

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 3½ per cent., February 8th, 1912.

RE DAVIS ELECTRICAL CO., LTD.

The creditors and shareholders under the failure of the Davis Electrical Co., Ltd., of 17, Moor Street, Cambridge Circus, W.C., particulars of which recently appeared in these columns, met on Tuesday at the Board of Trade Offices, Carey Street, W.C.

Mr. W. J. Warley, Official Receiver, reported that there had been lodged 57 claims amounting to £2,332. With regard to the affairs of the company, the observations which had been issued to the creditors and shareholders showed what course had been taken. The matter of chief moment at the present time was the manner in which the securities held by the debenture-holders had been increased in value. He had not anything more to add upon that point to that had already appeared in his observations, except that it might be taken that the ordinary quantity of goods which would have been needed by the company during the period September 1st to October 6th, 1911, would not have been more than one-third of that which had been ordered in this particular period. That being so, it would be a matter for the consideration of the liquidator as to what steps might be taken with a view to the recovery of some part, at all events, of the securities for the benefit of the unsecured creditors. That was a matter which absolutely demanded some further investigation, and it would rest with the creditors to decide upon what steps should be taken. The immediate business of the meeting was to consider whether a liquidator should be appointed in the place of the Official Receiver and to elect a committee of inspection.

Mr. Kennard (Stanley Evans & Co.) said he appeared on behalf of the company.

The Chairman : You mean for Mr. Davis when you say company ? —Yes.

Mr. Kennard (continuing) said that when the company was formed the liquid assets were worth in value a good deal more than the amount of the debentures which were then issued. When further debentures were issued, he thought he was correct in stating, the amount received in respect of these debentures went to the trade creditors in payment of the debts. That was the result of the Official Receiver's investigation.

The Chairman : That may be so, but when you say payment of debts that includes expenses of business and large sums paid away for salaries. The whole amount paid was not exclusively for goods supplied to the company.

Mr. Kennard said that his point was that the money paid by the debenture-holders was expended by the company for the purpose of the company's business and included payments made to trade creditors. He was instructed to take exception to the report of the Official Receiver, which said that from September 1st to October 6th, 1911, goods were delivered to the company much in excess, as regarded value, of any delivered during a similar period of trading at any time during the company's existence, viz., £1,613 16s. 6d., of which £1,034 related to the time between September 25th and October 6th. These figures were not quite accurate because it would appear that the amount £1,034 should be something like £865. It was not a very great difference, but when the Official Receiver issued observations relating to the purchase of goods and was not accurate in his figures, he claimed that he was entitled to call attention to the discrepancy.

The Chairman : I have the invoices here, but I am glad to have any explanation you wish to make.

Mr. Kennard pointed out that one of the invoices was re-dated, and, consequently, these goods had not come within the period in question.

The Chairman said it was only a question of a few days, and did not materially affect the bearing of his report.

Mr. Kennard said his point was that the figures £1,034 should have been £862.

The Chairman remarked that the difference of a week or a fortnight would not effect any material alteration.

Mr. Kennard said the matter had been considered by Mr. Davis, and he was bound to admit that the goods ordered within the period in question, although ordered in the ordinary course of the business, went to the benefit of the debenture-holders. He had very carefully considered the matter, and had put it to the debenture-holders that, under the circumstances, although they were legally entitled to rely upon their security, it might be a matter for them to consider whether, under the circumstances, they might not see their way to give up some of the security for the benefit of the trade creditors. If anything of that kind were to be arranged, it must be understood that the object of so doing was not to evade any threats, nor because anything in connection with the company had not been carried on in a proper and perfectly *bonâ fide* manner. If the creditors wanted a further investigation they were perfectly willing, and the parties attacked would give them all the assistance in their power. If, however, his offer was to be accepted, it must be taken as a settlement of the whole thing, and must be accepted in full satisfaction of any claims which the creditors might deem they had against the company or any officer of the company. He had consulted one of the principal creditors, and a sum of £500 had been mentioned as an amount which the debenture-holders might be prepared to pay over to the liquidator upon the terms he had mentioned. That sum would be added to the assets of the company, free from any claims of the debenture-holders, but, he repeated, that could only be done on the understanding that any claim by the liquidator and committee of inspection would be entirely withdrawn.

Mr. Rook (Sloan Electrical Co.), speaking on behalf of the principal creditors, said that they had very carefully considered this matter, and for two reasons were not inclined to accept the offer which had just been placed before the meeting. In the first place, there were conditions attaching to the offer which might sweat the £500 down, with the result that the creditors would only get a very small dividend indeed. The general body of creditors would have been quite prepared to accept the £500 and take the small dividend, but, speaking on behalf of the largest creditors, he must say they were inclined to insist upon a further investigation. It mattered very little whether the value of the goods received by the company just before the collapse was £1,034, as stated by the Official Receiver, or only £860, as represented by Mr. Kennard. The question at issue was that they, as creditors, having confidence in the company, had delivered goods between those dates to the amount of about £1,000, and they claimed that those goods had gone to enhance the value of the debentures. As a matter of principle, apart from the question of money, he thought the commercial world would be better served if the question were fought out as to whether a company, consisting practically of one man, could, from the date of consulting its solicitor to the date of the winding-up order, purchase goods and throw them into "hotch-potch." The view of the creditors was that a further investigation into the matter would perform good service to the commercial world, and he was instructed to refuse the offer, and press the liquidator to conduct a further investigation into the whole matter of the debenture issue.

Mr. Pangbourne (Siemens Bros.) formally moved that the liquidation be continued by the Official Receiver and a committee of inspection.

The resolution was unanimously agreed to, and the following Committee of Inspection was elected, viz. :—Mr. Rook (Sloan Electrical Co.); Mr. Pangbourne (Siemens Bros.); Mr. Loewy (Electrical Co.); Mr. Lowe (Messrs. McDougall); Mr. Francis Nalder (Nalder Bros. & Co.).

Mr. Kennard, again addressing the meeting, said that, of course, the suggestion he had made was not put forward under threat of any pressure, but was an *ex gratia* offer. The creditors might take it or leave it, but if they decided upon a full examination they could not expect that the debenture-holders would renew the offer, but they would do their best to retain the security to which they were undoubtedly entitled. There was another matter to which he wished to call attention. The Official Receiver had reported that no creditor in respect of goods was paid after September 15th, but in the fortnight prior thereto accounts for goods amounting to about £310 were paid. He was instructed that that amount should be increased by more than £50. The total payments during the period came to £633.

The Chairman : Are they trade accounts ?

Mr. Kennard agreed that they were not, but added that in making those payments the company were discharging liabilities which would have taken preference over the unsecured claims.

The Chairman : In any case these payments increased the security of the debenture-holders.

Mr. Rook pointed out that Mr. Kennard had made reference to the amount of goods ordered, but he was informed that some of the orders were never executed, and that the amount of £1,034 given by the Official Receiver would have been considerably more had all the orders been executed. The proceedings then terminated.

In the absence of a quorum the meeting of shareholders was formally adjourned for a week, but it was understood that the desire of the creditors for the liquidation to be left in the hands of the Official Receiver would be confirmed. The following are the principal unsecured creditors :—

Associated Battery Co.	£20	Kingolite Co.	£40
Adnil Electric Co.	29	London Commercial Elec. Stores	45
Busch, F. W.	30	Marsh, Son & Co.	31
B. T.-H. Co.	17	McDougall, James	395
Conradty & Co.	313	Nalder Bros. & Thompson	18
Credenda Conduit Co.	88	Reckming	32
Cable Accessories Mfg. Co.	12	Radium Electric Co.	13
Electrical Co.	294	Siemens Bros. & Co.	116
Electric and Ordnance Co.	21	Sloan Electrical Co.	32
Fisher & Ludlow, Ltd.	103	Simplex Steel Tube Co.	26
Feld Bros. & Co.	83	Soutter, W., & Sons	32
General Electric Co.	20	Sluyters & Co.	12
General Accessories Co.	21	Société Belge Cable Co.	12
Gent & Co.	15	Schoen Bros.	32
Goossens, Pope & Co.	28	Thonwarth-Agent Carl Waltezahn	69
Galsworthy, Ltd.	19	Turner, Bergen & Co.	42
Hartwell, I. (Executors of)	52	Tucker, J. H., & Co.	17
Hunter Electrical Co.	29	Thomas, F., & Co.	14
Heatley Gresham Eng. Co.	17	Union Electric Co.	27
Hayward & Co.	13	Wolfram Lamp Co.	139
Holophane Glass Co.	12	Wittusen, H., & Co.	16
India-Rubber Elecl. Supply Co.	113	Wardle Eng. Co.	13
Johnson & Phillips, Ltd.	150	Best & Lloyd, Ltd.	13
Kremenzky, John	116	Stanley, Evans & Co.	17
Krugers Friedeburg	58	London and County Banking Co.	25
Kempton & Co.	11		

Trade Announcements.—Messrs. Morrison & Co., of Chile, who for many years have been in the market for the purchase of goods for their engineering, hardware and merchant business, have now opened their own buying agency in London, at 11, Queen Victoria Street, E.C. Hitherto their purchases have been in the hands of Mr. G. T. Harrap, who, in ceasing to act for Messrs. Morrison, will carry on his old-established business of consulting engineer, at 5, Budge Row, Cannon Street, London, E.C.

Mr. John F. Monnot, of 41, Great Portland Street, London, W., has secured the sole concession for the Edison storage battery from the Edison Electric Manufacturing Co.

COPPER: ITS PRESENT POSITION AS REGARDS PRODUCTION AND PRICE.

By JOHN B. C. KERSHAW.

The long expected rise in the price of copper has at last occurred, and the metal has once again touched the £70 level, with every prospect at the moment of going still higher. It is now over four years since the last boom in copper prices came to a sudden end, and the price of the metal fell from £104 per ton on April 30th, 1907, to £57 12s. 6d. within the 12 months.

The questions which all large consumers of copper desire to have answered are: How long will the present upward tendency in the price of the red metal last, and how far is it likely to go?

Is it likely that the experience of 1906 and 1907 will be repeated, and that copper once again will soar to over £100 per ton, and remain at that high level of value for over six months? The following figures are designed to throw some light upon the answers to these questions.

Production and Stocks.—The total output of copper in 1911, according to Messrs. H. R. Merton & Co.'s Annual Statistical Statement, amounted to 873,460 tons, as compared with 855,685 tons in 1910. The totals for the last ten years have been as follows:—

Year.	Total output tons.	Increase: tons.	Year.	Total output tons.	Increase: tons.
1902 ...	541,295	24,000	1907 ...	713,965	(—135)
1903 ...	574,775	33,000	1908 ...	754,180	40,000
1904 ...	644,000	70,000	1909 ...	839,425	85,000
1905 ...	682,125	38,000	1910 ...	855,685	16,000
1906 ...	714,100	32,000	1911 ...	873,460	17,800

The increase in output in 1911 has thus been 17,800 tons, as compared with 16,000 tons in 1910; and the check to production which has brought about the present rise in prices, is seen to have been negative rather than positive in character. When we examine the average rate of increase in output during the period covered by the above table, we find, however, that during the 10 years the production increased by 332,000 tons, equal to an average rate of increase of 33,200 tons per annum. The reduction of this rate by 50 per cent. for two years, has therefore enabled consumption to overtake production, and to deplete the large stocks of the metal accumulated in the years 1909 and 1910.

The remarkable reduction in stocks that has taken place during 1910-1912 is well brought out, by the following figures (taken from Messrs. H. R. Merton & Co.'s monthly circulars) for the combined visible supplies of copper, excluding Holland and Germany.

	Tons.		*Tons.*
June 30th, 1910 ...	179,129	June 30th, 1911 ...	140,455
Sept. 30th, 1910 ...	160,386	Sept. 30th, 1911 ...	130,239
Dec. 31st, 1910 ...	138,275	Dec. 31st, 1911 ...	97,218
Mar. 31st, 1911 ...	154,592	Mar. 31st, 1912 ...	78,018

The reduction by 50 per cent. of the stocks of copper in England, France and America, has had the desired effect, and has caused that rise in price which had been expected, so soon as the combined stocks in America and Europe fell below the 100,000 ton level. It may be pointed out here, however, that the stock *in England* and France and afloat thereto is still considerably higher than it was during the six months of 1906 and 1907, when copper was over £100 per ton; on April 15th, 1912, being 49,434 tons, as against 13,483 tons on February 28th, 1907.

Making use of the figures already given for calculation of the consumption of copper, in the years 1909-1910-1911, we obtain the following:—

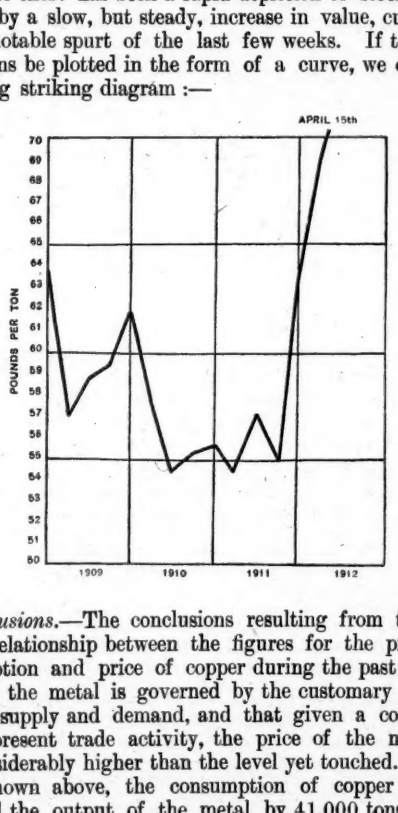
Year.	*Stocks.*	*Production.*	*Consumption.*
1909	+ 61,700 tons	839,425 tons	777,725 tons.
1910	— 34,100 ,,	855,685 ,,	889,785 ,,
1911	— 41,000 ,,	873,460 ,,	914,460 ,,

In 1909 the production exceeded the consumption by 61,700 tons, and stocks increased by this amount, whereas in the years 1910 and 1911 the position was reversed, and consumption exceeded the output by 34,100 and 41,000 tons respectively. The copper consumed in the twelve months ending December 31st, 1911, in fact, totalled 914,460 tons, an increase of 25,000 tons upon the aggregate consumption of 1910. At this rate of progress the world's demand for copper will reach 1,000,000 tons per annum by 1915.

The relation between Stocks and Price is shown by the following table, giving the figures as recorded in Messrs. Merton's monthly circular, at the end of each quarter since December 31st, 1908:—

	Stocks.	*Price.*
Dec. 31st, 1908 ...	110,667 tons ...	£63 15 0
March 31st, 1909 ...	132,729 ,, ...	57 0 0
June 30th, ,, ...	136,512 ,, ...	58 17 6
Sept. 30th ,, ...	161,473 ,, ...	59 7 6
Dec. 31st ,, ...	172,310 ,, ...	61 15 0
March 31st, 1910 ...	166,711 ,, ...	57 17 6
June 30th ,, ...	179,129 ,, ...	54 10 0
Sept. 30th ,, ...	160,386 ,, ...	55 2 6
Dec. 31st ,, ...	138,275 ,, ...	55 17 6
March 31st, 1911 ...	154,592 ,, ...	54 10 0
June 30th ,, ...	140,455 ,, ...	57 0 0
Sept. 30th ,, ...	130,239 ,, ...	55 0 0
Dec. 31st ,, ...	97,218 ,, ...	62 15 0
March 31st, 1912 ...	78,018 ,, ...	68 10 0
April 15th ,, ...	— ...	70 7 6

From these figures we see that the stocks of copper reached their maximum in May and June, 1910, when they totalled 179,129 tons, and touched a level equal to one-fifth of a year's consumption, and that the price of the metal reached its minimum (£54 10s. per ton) about the same time. Since that date there has been a rapid depletion of stocks, accompanied by a slow, but steady, increase in value, culminating in the notable spurt of the last few weeks. If these price variations be plotted in the form of a curve, we obtain the following striking diagram:—



Conclusions.—The conclusions resulting from this study of the relationship between the figures for the production, consumption and price of copper during the past few years are that the metal is governed by the customary economic laws of supply and demand, and that given a continuance of the present trade activity, the price of the metal may rise considerably higher than the level yet touched.

As shown above, the consumption of copper in 1911 exceeded the output of the metal by 41,000 tons, and the figures for 1912, when complete, may quite possibly show a still larger consumption of the red metal, and a further depletion of stocks in order to meet the demand. Any further rise in price is, however, likely to cause a spurt in the production of the metal, and though copper may quite possibly touch £80 per ton before the current year is ended, the writer considers it unlikely that the extraordinary high level of prices attained in the winter of 1906-1907, will again be reached.

The swing of the pendulum and the end of the trade boom on this side of the Atlantic may, on the other hand, cause a falling-off in the European demand for the metal. Although this may to some extent be counteracted by the business activity which is certain to follow the end of the Presidential campaign and election in America, one cannot prophecy with great certainty as to the price of copper at the end of 1912. The writer's advice, therefore, to large consumers of the metal is, to buy cautiously and not to commit themselves too far ahead, the present position of the copper market being one which demands on the side of the buyers a policy of merely covering the immediate requirements of the moment.

AUSTRALIAN TRAMWAY COMPANIES AND THEIR EMPLOYÉS.—II.

On March 4th last the Federal Arbitration Court commenced the trial of the action brought by the Australian Tramway Employes' Association against the various Melbourne, Adelaide, Brisbane, Hobart, Ballarat, Perth, Fremantle, and Coburg tramways undertakings, dated October, 1911, and claiming higher wages and new conditions of service. These claims are numerous and controversial, and as it is understood that the Union intend to call over a hundred witnesses, the case is expected to last for a considerable time. As the companies have to be represented by their permanent officials, the tax on the staff of the affected concerns can be imagined.

As this claim directly concerns tramways, and may be taken as an authoritative statement of the demands of labour in such undertakings, an examination of its proposals may prove of interest.

The grounds of dispute are first given, and these include all apparent points on which disagreement was possible.

The minimum rates of pay per day demanded for each class of worker are then given. There are 72 rates in all, a few being :—Motormen and conductors, 11s. ; ticket examiners, 12s. ; leading car cleaners, 10s. ; car and motor cleaners. 9s. ; overhead wiremen, 12s. ; motor tower wagon drivers, 10s. ; power house engine drivers, 14s. ; firemen of four fires, 13s. ; general labourers, 9s. These rates to be operative in the States of Victoria, New South Wales, South Australia, and Tasmania ; to be subject to 10 per cent. increase for the State of Queensland, and 15 per cent. increase for the State of Western Australia.

The working hours per day to be eight, and a week's work to consist of 48 working hours. Only 10 per cent. of the motormen and conductors to be allowed to work in broken shifts, and these are to complete a day's work within 10 hours of the time of signing on. All other employés to complete the day's work within 8¾ hours of the time of signing on.

A monthly list of duties for each man to be posted, showing one day's holiday per week, and if any employé is asked to work on any listed holiday, he shall be paid time and a half rates. Sunday work to be paid double time and to be taken by motormen and conductors in rotation.

An employé attending on request at the depôt and signing on, and then not required, to be paid four hours' time. An employé signing on and starting duty to be paid a full day's pay.

All work done on eight public holidays to be paid double rates.

All employés of more than 12 months' standing to have 21 days' holiday per year on full pay.

Full pay to be given for sickness, no matter, apparently, how long this may continue, and on recovery each employé is to be restored to his position.

Full pay to be given for time lost through accidents other than those caused by wilful neglect. Half-pay to be given when the employé is partly responsible.

Free passes over the system on which they are employed to be given to all employés. The claim then stipulates for one summer and one winter suit, one cap and one helmet each year, and one great coat and one oilskin every two years. Watches to be provided and kept in repair by the companies. Interest at the rate of 5 per cent. per annum to be paid by employers on all fidelity money found by employés.

Three minutes' standing time at least to be allowed at each terminus. Meal relief to be provided within 50 yards of the meal room.

The next proposal demands "that preference shall be given to members of this organisation in each tramway system, other things being equal." The right to wear a badge of membership and the grant of reasonable facilities for doing the work of the Association are then insisted on.

Then follow eleven regulations called working arrangements. These demand fixed stopping places, specify how the cars and motormen's cabs shall be constructed, class of brakes to be provided, number of men per car and per trailer, and generally deal with matters concerning the working of the line which the management should in all cases decide on.

Not content with stating how the line should be worked, the next clause deals with the way appointments are to be made. This is to be by examination and six months' probation. Eyesight tests are to be limited to practical tests under working conditions.

The manner in which complaints against employés are to be dealt with next receives attention. If summoned to the head office and kept waiting they are to be paid double time, and every facility is to be granted employés in obtaining evidence to rebut any charge made either by the employer or the general public.

An Appeals Board is to be formed on each system, consisting of a permanent official of the employer and a representative of the men's Association (not necessarily an employé of the undertaking), with an independent chairman. Any employé undergoing discipline for any offence may take his case to this Board, and may have his case argued by a Union official. If an employé feels aggrieved at the action of any superior official, he may first complain to the employer, and then appeal to the Board, whose decision shall be final.

The two last clauses prohibit any regulation of a tramway company in any way limiting the employés rights as a citizen, and declare null and void any agreement or regulation which in any way interferes with the right of an employé to become a member of the Association.

Such, in brief, are the claims which are the subject of the present action.

In his opening speech, Mr. Prendergast, the president of the Association, stated that they placed their claim for preference to be given to their members in a very prominent place, and looked on it as a matter of life and death to the Association. They alleged that non-union men were promoted over their heads, and that every small dereliction of duty on the part of their members was severely punished.

The Judge dissented from many of Mr. Prendergast's statements, and pointed out that he was not there to tell the employers how to manage their business, but only to try and settle disputes.

Several of the companies then claimed discharge from the case ; one, the Brisbane Co., as they had no members of the Association in their employ, some as they had minimum rates of pay specified in their articles of association, and others because they were bound by their arrangements with the Carters' and Drivers' Union.

One small undertaking, the Coburg, said to have the reputation of having the slowest tramway service in the universe, made this excuse, calling forth the inquiry from the Judge : What do you call the driver of the horse which draws this perambulator of yours—(laughter)—a carter or a driver ?

The next day was occupied by the evidence of the Secretary and President of the Association, who tried to prove that the policy of the Association was very moderate. They pointed out that while the policy of the Australian Labour Federation was to endeavour to gain their object through a general strike, they were in favour of proceeding rather by negotiation and arbitration, and that it was largely by their advice that a strike at Adelaide was postponed.

The President, in his evidence, stated that in August, 1910, he was in the service of the Prahran-Malvern Tramway Co. as conductor, and found there was a great deal of dissatisfaction with their conditions. He said that their efforts to form a Union had met with much opposition from the companies. One of them, the Melbourne Tramway Co., had dismissed five men at Brunswick ostensibly on the ground that they were dissatisfied with them. The matter had been brought before Parliament, with the result that the men were reinstated.

The hearing was then adjourned.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

New G.E.C. Griller.

The accompanying illustration shows the new restaurant type of griller or toaster made by The General Electric Co., Ltd., 67, Queen Victoria Street, E.C. It is built up in strong sheet-iron, mounted on a rigid angle-iron frame, the outside overall dimensions being 24 in. long × 12 in. deep × 18 in. high. The actual grilling or toasting area is 22 in. × 12 in. deep.

The heating element is placed in the centre of the griller and consists of open coil wires mounted on fire-clay insulators placed about 1½ in. apart, so as to do away with any danger of sagging. These insulators or carriers are mounted on a steel plate which is

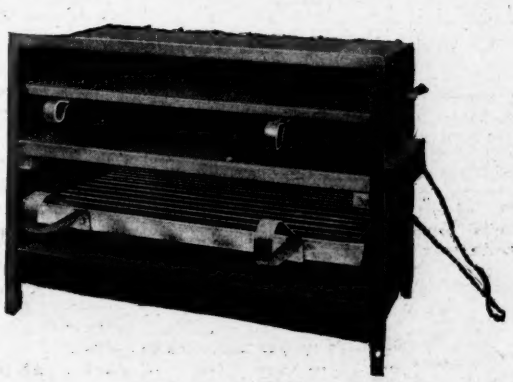


Fig. 1.—G.E.C. Griller.

riveted to the angle-iron frame. The wires are worked at bright red heat, and being made of the new "Archer" type resistance wire, they can work exposed to the atmosphere without any oxidising.

The heater is split in two with a pair of terminals fitted to each end of the griller, and each section consumes 1 kw.—*i.e.*, a total consumption of two units per hour. A grid and drip tin are provided, which slide on either of the the three sets of runners conveniently spaced under the heater.

Above the steel plate holding the insulators is a space measuring 22 in. long × 12 in. × 6 in. high with a removable shelf or damper,

and this can be used as a food or plate-warming chamber, or even if required, the steel plate itself can be used for frying on.

The griller is intended for use in all classes of restaurants, clubs and eating houses of every description and appears to meet a real want. At a recent test it was demonstrated that, starting from cold, ten full slices of bread could be toasted both sides in 3½ minutes.

"Barrow" Street Lighting Fittings.

These fittings have been designed primarily for the lighting of tramway routes where span-wire construction is in use.

After numerous experiments they have been adopted by the Barrow Corporation for lighting the main road into Barrow from the south; being a residential district, the road is entirely dependent upon the street lamps for illumination. The system was developed by Mr. H. B. Burnett, the borough electrical engineer, and was described as follows, in a paper by Mr. J. D. Mackenzie, before the I.E.E., Glasgow.

The road has a total width of 80 ft., and trees are planted along each footway. A 7/16 galvanized steel suspension wire is fixed across the road between each pair of tram poles, and from this are suspended two fittings, each being fixed 13 ft. 6in. from the centre of the roadway. The fittings are 6 ft. 3in. in length over all, and bring the lamp to a height of 17 ft. 6 in. from the road level.

The stems of the fittings are passed through reel insulators, which are attached to the tramway span-wire, thus preventing the fittings from swinging, while leaving them free to move vertically.

The work upon which the above results were obtained was carried out under the most unfavourable climatic conditions, and it is anticipated that the costs will be reduced on the remainder of the work, which is now in hand.

Cab-tire sheathed cable, though somewhat expensive, has also been employed for wiring from the fittings to the cut-outs, with a view to securing immunity from faults on this portion of the work.

In the case under consideration a spare conduit had been laid a few years ago, when other extensions were in progress, and therefore this has been utilised, and a public lighting main drawn in, thus making it possible to control each circuit by means of a clock switch, which switches off one-half of the lamps at 11.30 p.m.

Although the initial cost of this arrangement is considerably greater than that of connecting each pair of lamps direct to the distributing mains, it undoubtedly makes a more satisfactory arrangement, and it will generally be found that the increased capital charges are at least counterbalanced by the saving effected in the attendance charges, especially in cases where the lamps are situated at a considerable distance from the generating station.

The results obtained with this method of lighting have given the greatest satisfaction.

The illumination obtained from two 60-watt metallic-filament lamps on each span, as described, is decidedly superior to that obtained from 10-ampere open-type arc lamps fixed on alternate tram poles, although the consumption of electricity in the case of

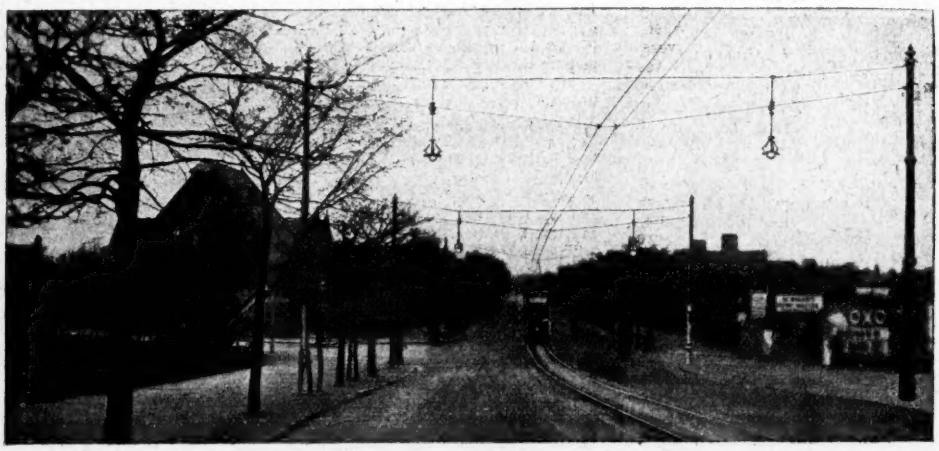


FIG. 2.—THE BARROW STREET LIGHTING SYSTEM.

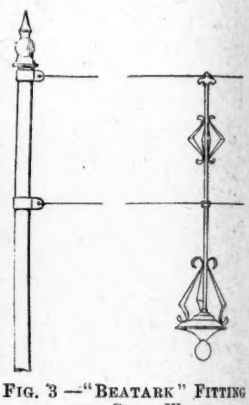


FIG. 3.—"BEATARK" FITTING AND SPAN WIRES.

The fittings are fixed to the suspension wire by means of "U" binders; these are also used for fixing the insulators to the span-wires, so that the erection of a fitting only occupies a few minutes.

The lanterns employed are 18 in. "Beatark" fittings, in each of which one 60-watt metal-filament lamp is at present fixed, but allowance has been made in wiring for these being replaced by 100-watt lamps, should it be considered advisable to increase the illumination. The total weight of each fitting complete with lantern is approximately 17 lb.

A small three-way fuseboard in a cast-iron case is fixed to each tram pole along one side of the road, about 5 ft. from the ground, and from the outlet of this is taken a two-core 3/22 cab-tyre sheathed cable, which runs up the inside of the tram pole and out through the finial, thence along the suspension wire to the first fitting, from which two-core 3/22 cab-tyre sheathed cable is taken to the fitting on the other side of the road. These cables are fixed to the suspension wire by means of two part-porcelain insulators spaced about 3 ft. apart.

The connection from the main to each pair of lamps is made by means of three-core 3/22 paper-insulated and lead-covered cable drawn into 1-in. galvanized tubing, which passes through the base of the pole into the bottom of the fuseboard.

The capital cost of erecting and connecting complete three circuits, consisting of 112 lamps (56 spans), in the manner described, has been as follows:—

	Capital cost. Total.	Per lamp.
112 suspension fittings, erected complete ...	£177	
Wiring	108	
Total cost of lamps erected and wired to cut-outs	£285	£2 10
Additional cost of laying service and main cables and controlling by clock switches:		
Services from main to three-way fuse-box, including fuse-box, &c.	£122	
Three control pillars, clock switches, &c. ...	41	
Main cable, exclusive of conduit	141	
Conduit, at 2s. per yard	235	
Total cost of lamps, complete with underground main and clock-switch control ...	£824	£7 7

From these figures it will be seen that the total cost of erecting lamps complete on this system, and connecting them to the cut-outs at which the service cable terminates, amounts to only £2 10s. per lamp. (These figures could be very materially reduced if the mains were carried overhead on the tram poles.)

the metal-filament lamps is only 5·04 KW. per mile of street, as compared with 11·5 KW. per mile of street in the case of arc lighting. The annual cost of the lighting on this system will also be found to be less than one-half of that with 10-ampere open-type arcs, the charge for electricity and allowance for interest and depreciation being the same in each case.

The price at which this lighting is being undertaken by the Electricity Committee at Barrow is £2 per annum per 60-watt lamp, one-half of the lamps being extinguished at 11.30 p.m. This price is equivalent to £168 per mile of street per annum, as compared with £367 per mile per annum for arc lighting.

The method of suspension employed entirely overcomes any trouble which might otherwise be experienced with metallic-filament lamps due to the vibration of the tram poles caused by the passing of cars. The average life of 60-watt lamps in four experimental fittings, which have been in use for some time past, already exceeds 1,200 hours, although three lamps have been broken, either in storms or due to defects in the fittings, and four are still burning.

In the case of six experimental fittings in which 100-watt lamps have been used, the results which have been obtained are even more satisfactory, the average life of the first six lamps in these fittings being no less than 2,071 hours.

Ball-Bearing Line-Shafting Hangers.

THE HOFFMANN MANUFACTURING CO., LTD., Chelmsford, have introduced the "Hoffmann" ball-bearing hanger, which is shown in fig. 4. The main housing is fixed to the hanger casting by means of three eyebolts, allowing an easy means of vertical adjustment during erection, and as the holes in this casting are slotted out, horizontal adjustment can also be made. The main hanger castings can be erected quite independently of the bearing, this being done by withdrawing the pin which runs through the eye-bolts. It is claimed for the "Hoffmann" hangers that they have most effective compensating devices, obtained, first, by allowing the whole housing to swing on its hanger (to prevent the whole shaft swinging endways, one hanger in each line shaft is fixed by means of the locking device shown in fig. 4); secondly, by constructing the bearing with a spherical seat.

The inner ball-race is firmly clamped to the shaft by means of a split taper sleeve, while the outer one is fitted in the spherical seat of the housing. The position of the bearing can readily be changed, as no wear comes on the shaft. There are two side plates which are a sliding fit in the spherical seating of the housing on their circumference, and a running fit on the split taper sleeve, a pin being provided to stop any tendency to revolve. These plates, being

able to move with the bearing in the spherical seat, are thus enabled to keep a tight fit, even if the shaft should be untrue. Grease-retaining grooves are turned in their bore, which retain the grease

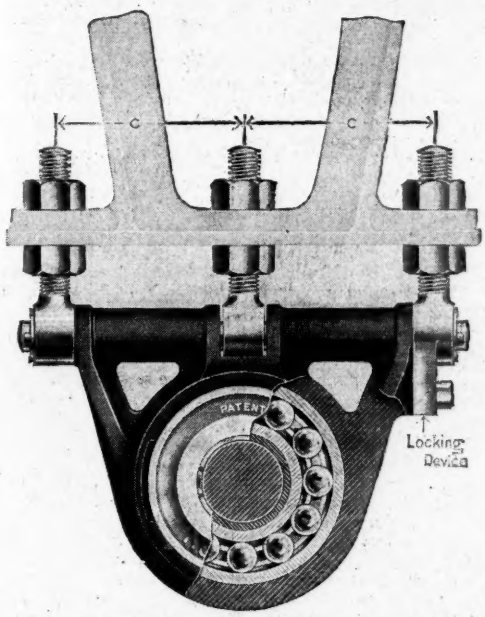


Fig. 4.—Hoffmann Patent Ball-Bearing Hanger.

in a very effective manner. Greases containing graphite or chalk should not be used, as they tend to lap down the races and balls. These bearings are made in both hanger and pedestal patterns and in the usual range of sizes.

Simplex Egg Boiler.

The egg boiler shown in fig. 5 is being manufactured by Messrs. Simplex Conduits, Ltd., Garrison Lane, Birmingham, and is made in two sizes, respectively suitable for cooking three and six eggs at one time. The design is conventional, and in keeping with the object for which the appliance is intended; at the same time

Fig. 5.—Simplex Electrical Egg Boiler.

it is well finished and made in copper, so as to constitute an ornamental addition to the breakfast table. The loading of the three-egg size is 300 watts, and as only a very small quantity of water is required for the operation of the apparatus, this loading is amply sufficient to raise the water to the necessary temperature for the cooking of the eggs within a few minutes of its being put on circuit. The six-egg size is relatively highly loaded.

New Insulator.

The accompanying figures show a new type of insulator which has been devised by Mr. George Bull, of 50, North Lonsdale Street, Gorse Hill, Stretford, Manchester. The body of the insulator can be made to suit telephone and telegraph wires, as illustrated, or high-pressure lines by providing additional sheds; the special feature is the method by which the wires are attached to it, with the aid of a brass clamp and wing-nut. Obviously the attachment of wires is a very simple matter, as it is only necessary to slacken the nut, lay the wire in the groove between the clamp and the insulator, and screw up the nut. No tools are required, and a firm grip is obtained in a few seconds. The merits of this device

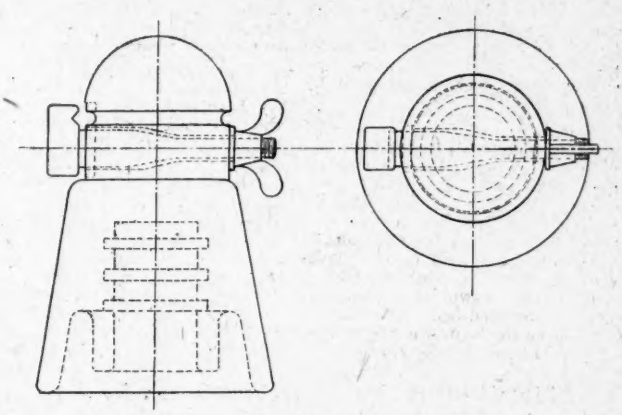


Fig. 6.—New Insulator and Clamp.

will be most fully appreciated by linemen in the winter season, as they need not spend much time at the top of a pole in fixing wires. The inventor has applied for letters patent for the device.

White Electrical Instruments.

In the new catalogue just issued by the White Electrical Instrument Co., of 2 and 4, Gloucester Street, Clerkenwell, London, E.C. (formerly the electrical department of Messrs. James Pitkin & Co.), the firm have devoted special attention to their iron cased switchboard instrument in which improvements are embodied for ensuring accuracy and durability. The makers claim that every detail in size and shape of cover and scale has been carefully studied to facilitate readings being taken easily and correctly, whether the instuments happen to be fixed at eye-level or otherwise. Various types of portable instruments are also described and illustrated, and likewise a number of testing sets for the measurement of insulation and resistance. Several novel forms of conductivity testing sets are included. The accompanying illustration (fig. 7) shows one of their type "T" portable wattmeters which has a moving-coil dynamo-

Fig. 7.—Type "T" White Portable Wattmeter.

meter movement and is supplied in a polished teak case with leather handle, also with rubber buffers to prevent injury in transit. It has a 6-in. silvered and engraved dial. The instrument can also be supplied in a leather case lined with green baize, and having a sling strap. The list should be useful to switchboard makers and electrical contractors.

Moulded Steatite.

Steatite, as an electrical insulator, has been known and used to a limited extent for many years in this country, but only in the native form; and the necessity of cutting it out of the solid—an expensive process—has precluded its employment, except for special purposes, though its ability to resist high temperatures is a very valuable characteristic. A process has, however, been developed for moulding steatite into any desired form and afterwards baking it at a high temperature, the resulting product being extremely hard and tough, besides possessing excellent insulating qualities We recently inspected a variety of parts of moulded steatite, such as tumbler switch bases, bayonet lampholder interiors, &c., at the offices of Messrs. Krausse & Auerbach, of 45, Basinghall Street, E.C., and were impressed with the perfectly sharp edges and the strength of the material, in both of which qualities it is superior to porcelain. While only a few British manufacturers have as yet "discovered" this useful material, we understand that it has been

widely employed on the Continent by some of the largest firms for several years, single orders for a million pieces at a time being not uncommon. Even such parts as links and dollies in tumbler switches—which, if made of metal, are difficult to insulate satisfactorily—can be made of moulded steatite, which has ample strength for the purpose, and it can be had in the form of slabs, &c., of practically the same dimensions as can be attained with porcelain. It is worthy of the careful attention of makers of switches, fuses and similar apparatus.

Split-Seconds Chronograph.

Messrs. Wales & McCulloch, of 20, Ludgate Hill, E.C., recently submitted for our inspection a handsome specimen of their 18-ct. gold split-seconds chronograph, which received exceptionally high commendation at the hands of the Kew testing office. It occasionally happens that it is necessary to record separately the durations of two events which start simultaneously, but do not stop at the same time, and for such a case the split-seconds device, reading to $\frac{1}{5}$ seconds, is admirably adapted.

PROCEEDINGS OF INSTITUTIONS.

On the Power Factor and Conductivity of Dielectrics.

By J. A. Fleming, F.R.S., M.I.E.E., and G. B. Dyke, B.Sc., A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers, *London, March 28th*, 1912.)

In the present paper we concern ourselves only with the power factor and conductance of dielectrics under alternating electromotive force of low voltage, pure sine wave-form, and of frequencies between 900 and 5,000 p.p.s., as this has a close connection with practical telephony.

It has long been known that the conductivity of certain dielectrics for alternating currents of telephonic frequency is much greater than for direct or unidirectional currents.

Telephonists are well aware of the great effect which the ratio of the leakance of a line to its capacity per mile exercises upon the attenuation constant, and therefore on the speech-transmitting qualities, especially in the case of highly inductive or loaded lines. In these cases if S denotes the alternating-current dielectric conductance or leakance per mile and C the capacity per mile, the ratio S/C (denoted by s) is an important quantity.

This same ratio s concerns us in the case of condensers having dielectric conductivity or leakance, which are operated with simple harmonic alternating electromotive force of maximum value V and frequency $n = p/2\pi$. If a condenser or cable of capacity C has such a voltage applied to it, it creates a dielectric current $C p V$ nearly in quadrature with the impressed voltage, and also there is, or may be, a power absorption proportional, as shown by all experiments, to the square of the impressed voltage. This indicates that there is a current $S V$ in step with the voltage. Hence, the power factor of the condenser is given by the expression $s/\sqrt{p^2 + s^2}$, but for small power factors is sufficiently nearly expressed by s/p or by $S/C p$.

It is curious that cable manufacturers continue to pay such great attention to the so-called insulation resistance (I.R.) measured by applying a steady or direct-current voltage to the cable and then stating the I.R. as so many megohms per mile after 1 minute's electrification. Except as a rough test of dielectric strength and means of revealing defects of manufacture, the above measurement

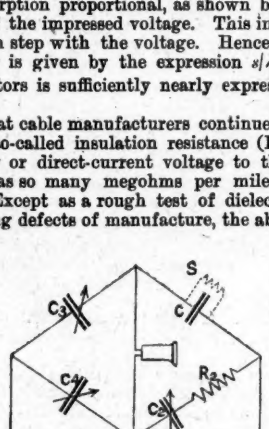


Fig. 1.

has very little, if any, scientific value. The quantities which have real significance are the alternating-current conductivity S for a stated temperature and frequency, the ratio $S/C = s$, and the ratio $S/C p = s/p$ (which when small is nearly the power factor), and the quantity usually called the admittance $\sqrt{S^2 + C^2 p^2}$.

In all these expressions when they occur in formulæ concerned with telephonic transmission and high-frequency currents, the symbol S is *not* to be taken as equivalent to the reciprocal of the insulation resistance measured with direct currents, nor is the C the steady or direct-current capacity, but they are quantities only to be obtained by special measurements.

We possess in the Pender Electrical Laboratory, at University College, London, an alternator built by Messrs. Crompton & Co., of Chelmsford, the normal frequency of which is about 900 p.p.s. The wave form of the E.M.F. is very far from being a simple sine curve; but this proves to be a great advantage, as it enables us to filter out three harmonics having frequencies in the ratio of 1 : 3 : 5, each of very pure sine-form.

For determining energy loss in dielectrics we gave preference to bridge methods, which would enable us to determine the conductivity and capacity separately, even when using very small condensers or short lengths of cable having a capacity of about a thousandth of a microfarad.

The arrangement is as shown in fig. 1, in which C_3, C_3 and C_4 are three air condensers of variable capacity; the resistance R_2 is a practically inductionless resistance, and C is the capacity of the condenser or cable operated upon, having a dielectric conductance represented by S.

The bridge is supplied with a perfectly pure sine-form E.M.F., having a value of 4 or 5 volts. The opposite corners of the bridge are connected to a sensitive high-resistance head telephone. The condenser or length of cable to be measured is then connected in as the fourth arm of the bridge. The experimental adjustment consists in varying the capacity of the condensers, C_3 and C_4, and the resistance R_2 for some selected value of the capacity C_2 until perfect silence is obtained on listening to the telephone.

Obtaining the equation $S/Cp = p\,C_2\,R_2 = x$, it is easy to calculate the separate values of S and C from the equation $C = \frac{C_2 C_3}{C_4} \times \frac{1}{1 + x^2}$ and $S = p\,C\,x$. These equations give us S and C in terms of C_2, C_3, C_4 and R_2, and also S/Cp.

We prepared a number of small condensers having dielectrics respectively of dry Manilla paper, paraffined Manilla paper, celluloid (cinematograph film), gutta-percha, pure india-rubber, vulcanised india-rubber, ebonite, glass, mica, sulphur, thin slate, and other materials. The dielectrics were sheets about 3·5 cm. by 12 cm. in size and 1 or 2 mm. or less in thickness, except the sulphur. The metal condenser plates were usually tin-foil, with a lug and with rounded corners, and a sufficient number of sheets taken to give a capacity of the order of 0·001 of a microfarad or rather less.

They were tested at three frequencies: viz., 920, 2,760 and 4,600 p.p.s., and at temperatures varying from −15° C. to 80° C. We also measured a dry-core paper-insulated telephone cable and two samples of gutta-percha-insulated cable, and certain pure dielectric such as paraffin wax and sulphur in the form of thicker flat plates.

Some of the results are given in the following table:—

Dielectric.	Frequency n.	Approximate dielectric constant k for frequency n.	Approximate percentage variation of k per °C.	Approximate A.C. resistivity in megohms per cm.³ for frequency n.	Power factor for frequency n.	Ratio $S/C = s$.
Glass at 17° C. ...	920	6·60	+ 0·260	16,900	0·018	104·0
	2,760	6·50	+ 0·190	6,400	0·016	277·0
	4,600	6·50	+ 0·160	4,000	0·015	433·0
Dry Manilla paper at 19° C.	920	1·95	+ 0·108	140,000	0·007	41·6
	2,760	1·95	+ 0·106	46,000	0·007	125·0
	4,600	1·95	+ 0·112	26,000	0·008	225·0
Paraffin wax at 17° C.	920	2·36	Nearly zero	2,460,000	0·0003	2·0
	2,760	2·36		493,000	0·0005	10·0
	4,600	2·36		296,000	0·0005	17·0
Mica at 16° C. ...	920	4·00	+ 0·060	423,500	0·001	7·0
	2,760	4·00	+ 0·060	141,200	0·001	21·0
	4,600	4·00	+ 0·060	50,000	0·002	58·0
Ebonite at 19° C....	920	3·17	+ 0·360	148,500	0·005	24·0
	2,760	3·15	+ 0·310	38,500	0·005	93·0
	4,600	3·14	+ 0·290	23,100	0·005	155·0
Vulcanised india-rubber at 17° C.	920	2·73	− 0·150	343,300	0·002	12·0
	2,760	2·71	− 0·130	103,000	0·002	40·0
	4,600	2·71	− 0·140	38,100	0·004	108·0
Gutta-percha at 15° C.	920	2·86	+ 0·105	33,700	0·020	117·0
	2,760	2·86	+ 0·124	10,200	0·023	389·0
	4,600	2·86	+ 0·133	5,600	0·025	708·0

These measurements show that the value obtained for the so-called dielectric resistance of insulators, by measuring the current which flows through them after applying for one minute a steady voltage, has very little relation to the true alternating-current resistivity, with which alone we are concerned in telephony. This latter number, as obtained and measured by us, is the real index of the energy dissipation in the dielectric.

The following are the conclusions arrived at as a result of the measurements:—

All the dielectrics so far tested prove to possess a true dielectric conductivity for alternating-currents considerably greater than for steady unidirectional currents.

This increased conductivity implies greater power dissipation for the same terminal potential difference or voltage.

The alternating-current conductivity increases with the temperature except in the case of vulcanised india-rubber rather below 20° C., and gutta-percha rather above 15° C., in both of which cases it decreases with rise of temperature. In the case of mica and very dry paper it is not affected to any sensible extent by rise of temperature over a range between 0° C. and 60° C.

The alternating-current conductivity is in most cases a linear function of the frequency, and may be expressed in the form $\sigma = a + b\,n$, where a and b are coefficients, which are functions of the temperature, and n is the frequency.

The alternating-current conductivity, especially that part of it denoted by a, is greatly increased by the presence of moisture in the dielectric. This part is probably identical with the true direct-current conductivity.

The part of the conductivity denoted by the coefficient a is possibly electrolytic in nature, whilst the part proportional to the frequency is a consequence of an energy loss which is possibly analogous to the hysteresis loss in iron.

The dielectric constant for alternating electric force is in most dielectrics rather smaller than that for steady or unidirectional electric force. In no case is it larger.

The ratio S/C_p, nearly identical with the power factor, is, for some dielectrics such as mica and dry paper, a constant independent of frequency and temperature. For most dielectrics it increases with rise of temperature, but decreases with rise of frequency. The power-factor variation with temperature of vulcanised india-rubber and gutta-percha is quite abnormal.

Those dielectrics such as celluloid and gutta-percha, which have large alternating-current conductivity, although free as far as possible from moisture, also exhibit in a marked manner the phenomena of dielectric absorption and residual charge.

For certain dielectrics there is a temperature at which the power-factor and alternating conductivity have maximum values.

Discussion.

Dr. Alexander Russell said the paper opened a new chapter in the theory of conductance of electricity through dielectrics; the authors had found out a law according to which current flow through a dielectric could be measured. He was afraid the theory of telephony would have to go through the melting pot, and he was not sorry for it. The authors criticised the ordinary test for insulation resistance, but it was efficient for weeding out faulty cable. The method described of filtering out harmonics was ingenious and simple. The critical part of the paper was the assumption (on page 21) that every condenser could be represented by a perfect capacity shunted by a conductance which varied with the frequency; this would have to be very carefully considered. The capacity bridge was well worth the reading of the paper. It appeared that the capacities of small condensers decreased with high frequency, and he could not understand a condenser's capacity varying, as it should, theoretically, be constant. Perhaps the authors' was not a true model of an absorptive condenser.

Mr. B. S. Cohen said it was surprising that even now the importance of alternating-current constants for telephonic and telegraphic work was not fully realised, and yet it was easier to get apparatus for such measurements than for direct-current measurements. Many condensers for telephonic work were found to have far less capacity than they were supposed to have; the effective insulation was also often low. The authors' scheme for wave filtering was very interesting; he suggested that the Campbell filter method inverted would eliminate all frequencies below a certain value, and this would have the advantage of more power than with the method used. Measurements by the authors and others gave the effective insulation with telephone currents of dry-core cable as a megohm per mile loop, but some measurements by himself and others using vector methods showed a result about a quarter of this.

Major A. J. O'Meara said it was known that damp seriously affected the properties of paper insulation, but the importance of this was not fully realised. He thought there was no other country where provision for the desiccation of underground telephone and telegraph cables was made, but the tables in the paper showed the necessity for this. The importance of the twin-wire system for submarine cables was appreciated at the time he (the speaker) read his last paper before this Institution.

Mr. A. Campbell disagreed with the statement in the paper that no current interrupter of any kind could be substituted for the sine wave alternator and wave filter, as he had been employing buzzers, interrupters and microphones on the same class of work for years, and he considered them equally good for such tests as the authors' arrangement. He described an arrangement of microphone hummer and Wien bridge, with which one could get 100 volts if desired, and pure wave form for frequencies from 300 to 3,000 per sec. He could use one of his wave sifters between the microphone hummer and tuning circuit and obtain frequencies corresponding to various harmonics; with an ordinary 5s. electric trumpet frequencies up to 4,000 were obtainable.

Mr. H. R. Kempe said the steady current insulation test was one of the very best for cable testing; A.C. high-frequency tests would not show defects in the same way as D.C. tests would, and the former was practically useless from the manufacturers' point of view. It was well known that gutta-percha improved with age, and experimenters should state that in giving results; some cores when first made had an insulation resistance of 200 megohms, but this might rise subsequently to as much as 10,000 megohms, which showed that a definite value for the specific resistance of gutta-percha could not be fixed. In order to get over the difficulty of determining when absolute silence had been obtained with the bridge-telephone method of testing, an assistant of his had introduced a short-circuiting key on the telephone which much facilitated accurate determination.

Mr. G. L. Addenbrooke also spoke, referring to experimental results obtained by himself, and mentioned that in some cases his results might be taken as confirming those in the paper. The authors decided to communicate their reply to the *Journal*.

THE KELVIN LECTURE.

On Thursday, April 25th, the third Kelvin Lecture was delivered at the Institution of Electrical Engineers, by Prof. H. du Bois, of the Bosscha Laboratory, Physico-Technical Institute, Berlin. He dealt with the work of Lord Kelvin in electricity and magnetism, extending over some two-thirds of a century, and described some of the later developments of his teachings by his pupils and followers. The lecturer pointed out that electrostatics was Lord Kelvin's first love, and summarised the large amount of scientific investigation which he carried out, leading ultimately to the introduction of such practical instruments as electrometers, electrostatic volt-balances, the electrostatic voltmeter, &c. One of Kelvin's aims was to make galvanic batteries amenable to electrostatic determination, and the lecturer outlined the experimental research carried out in connection therewith. Further, Kelvin in 1857 drew attention to the enormous variation of specific conductivity of copper for different samples and to the commercial importance of this fact. Eventually his long series of experiments led him to improve Wheatstone's device and construct the low-resistance bridge. Kelvin was the most prominent delegate at the first International Congress in Paris in 1881, to which we owed the sanction and legalisation of the volt, ohm, ampere, coulomb and farad. In the subject of magnetism Kelvin showed that a complete mathematical theory could be founded on known facts, the results agreeing with those previously deduced in other ways. His great work in this connection was detailed by the lecturer, as well as the practical applications of many of his discoveries. In conclusion, Prof. du Bois referred to the influence of Lord Kelvin on those students with whom he had had daily intercommunication; besides the British and American physicists educated in the Glasgow laboratory, he said that probably the Japanese and Polish schools had been most influenced. He was also appreciated in Holland, through the shipbuilding connection between that country and the Clyde, but his work had never been quite so well appreciated in Germany as, from the beginning, it was in Italy and France.

PARLIAMENTARY.

Keighley Corporation Bill.

A Select Committee of the House of Commons, presided over by Sir Charles Nicholson, commenced the consideration of the Keighley Corporation Bill before Easter. The main provisions of the Bill related to water, and these were considered first at great length. Part 5 of the Bill asked for powers to install a system of railless traction, for which the estimates amounted to £47 970.

Mr. Whitehead, K.C., in opening this part of the Bill, said there was considerable opposition to the proposals. Several of the adjoining local authorities, the County Council of the West Riding and the Great Northern and Midland Railway Companies had petitioned against the Bill. The opposition of the County Council was in respect of main roads, and that of the District Councils in regard to the district roads. They were asking for contributions towards the maintenance of the roads, for control over the standards and posts and equipment, and for certain guarantees regarding the service, &c. The object of the Corporation was to inaugurate a system of overhead trolley vehicles in order to link up the existing tramways with the outside district. Four routes were proposed, viz., from Uttley, in the direction of Skipton—four miles; from Stockbridge to Nab Lane—five miles; and also from the town to Oakworth and to Lane Fields. With regard to the powers for running motor-'buses, the object was to test other districts before embarking on the construction of further routes of trackless tramways, and also to have another system as a stand-by in case of the trolley system breaking down.

Mr. J. B. Hamilton, the general manager of the Leeds Corporation Tramways, was called and gave evidence as to the installation of the railless system in that town, which, he said, had been very successful.

After an adjournment, Mr. F. Fitzgerald, K.C., who represented the Bingley U.D.C., stated that the Board of Trade had intimated that they would shortly be prepared to make a provisional order sanctioning a tramway from Bingley to the Keighley rural area.

The representative of the Board of Trade replying to the chairman, said the order had really been made, but had not yet been introduced into the House. The Board were aware of the proposal for the trolley system, but they simply dealt with the tramway order on its merits.

Mr. Fitzgerald said that Bingley was prepared to widen the road where the Board of Trade thought it should be widened. An agreement had been come to with the Bradford Corporation whereby when the Bingley tramways were constructed they would be leased to the Bradford Corporation, which would give a route right into Bradford.

Having considered the question in private, the Chairman pointed out that it would be difficult for the promoters to persuade the Committee to give powers to run trackless trolleys over the same route as that on which a tramway was sanctioned.

Mr. Whitehead having consulted with his client, said that if Bingley was hostile to the proposal he agreed it would not be wise to press it on the Committee, but they did not believe Bingley was hostile.

The Chairman having intimated that the promoters might proceed with their case in the ordinary way, witnesses from

Keighley were called to prove that there was a large demand for communication between the Keighley district and Bingley.

Mr. Hamilton was recalled, and expressed the opinion that the routes proposed by the Bill would well serve the district, and that the working would result in a profit. There were no dangerous places in the routes proposed, and as Keighley did not contribute to upkeep of the roads over which motor-'buses were now run, he did not think they ought to contribute in respect of trolley vehicles. The installation of railless traction was under the direct control of the Board of Trade, and consequently there was no necessity for the local authorities having supervising powers. If either motor-'buses or trackless trolleys were only run from the terminus of the Keighley tramways to the boundaries of Keighley and Bingley, it would stop through communication between Keighley and Bradford, and it would not pay.

In cross-examination, Witness said he was unable to give any instance of a public authority which had been authorised to run trackless trolleys outside its district, and had not to contribute to the upkeep of the roads over which the system ran.

Mr. J. Moffet McElroy, general manager of the Manchester Corporation Tramways, endorsed the views of Mr. Hamilton.

Mr. D. Gray, manager of the Keighley Corporation Tramways, gave evidence to the effect that whilst he did not think an ordinary tramway service would pay between Stockcross and Nab Lane, he thought a railless trolley system would pay.

The Chairman said the Committee had decided to strike the route from Stockbridge to Nab Lane out of the Bill.

Mr. Fitzgerald asked the Committee to allow the Bingley Urban District Council their costs in regard to their opposition to this route, on the ground that the proposal had been unreasonable and vexatious.

The Chairman said the Committee would not agree to this.

The other part of the scheme was passed.

Considerable discussion took place with regard to road widenings and the question of the Corporation contributing to the maintenance of roads. Ultimately the Committee decided that where the cars ran county roads must be widened to 20 ft., and rural and urban district roads to not less than 17 ft., except where such widening would mean the widening of bridges. The Committee did not think the Corporation should be called upon to contribute towards the maintenance of roads.

Midland and London and Tilbury Railways Bill.

On Thursday, April 25th, a Select Committee of the House of Lords, presided over by the Earl of Camperdown, passed the preamble of the Bill promoted by the Midland Railway Co, for the vesting of the London, Tilbury and Southend Railway undertaking in the Midland Co. The only opposition to the Bill came from the Great Northern and the Great Eastern Companies.

Mr. Talbot, in opening the case for the promoters, said the proposal was in no sense a move in a campaign against the Midland Co.'s rivals, but it was believed the amalgamation would result in a great development of the traffic on the Tilbury Railway.

Sir Guy Granet, general manager of the Midland Co., said his company was at present connected with the Tilbury Co., and its acquisition would give them an outlet to the Thames. The first thing they would probably do was to electrify a considerable portion of the line, and he considered that the Midland Co., with its large financial resources, could do this more quickly and advantageously than could the Tilbury Co. He considered they would first wish to electrify the direct route to Southend, while the electrification of the lines from Barking to Tilbury and to Pitsea would be the next development. The electrification of the 2¾ miles of the London and Blackwall Railway, over which the Tilbury Co. ran to get to Fenchurch Street, could only be carried out by agreement with the Great Eastern Co., and he was prepared to give that company protective clauses.

In cross-examination by Mr. Balfour Browne, K.C., for the Great Northern Railway Co., Witness said there was nothing in the Bill which compelled the Midland Co. to electrify the line, but t was only by doing this that they could hope to get a profit out of the transaction.

Mr. A. L. Stride (chairman and managing director of the London and Tilbury Co.) said that the reasons which induced his board to agree to the vesting was that they were faced with a large capital expenditure in regard to increased station accommodation at Fenchurch Street, the electrification of the line, and for new rolling stock.

Before further evidence was called, Mr. Talbot stated than an agreement had been come to with the Great Eastern Co., with regard to Fenchurch Street, by which, amongst other things, the Great Eastern Co. agreed to do their utmost to facilitate electrical working over the Blackwall line.

Mr. Balfour Browne, K.C., addressed the Committee, and urged that the Great Northern Co. should be allowed absolute running powers over the line, but this the Committee refused to concede.

Metropolitan Railway Bill.—After a protracted hearing, Mr. Soames' Select Committee of the House of Commons which commenced the consideration of the Metropolitan Railway Bill before Easter, has rejected the principal proposal. The Bill sought authority to enable the company to make a new railway at Hammersmith to join up with the authorised line of the Great Western Railway Co. to West Ealing, and thus to give yet another route from Ealing to the City; and it also sought power to enable the company and the Metropolitan and Great Central Joint Committee to construct a railway from Rickmansworth to Watford, and to give the Metropolitan Co. running powers over the new Great Western line to Ealing Broadway. After hearing a great deal of evidence, including that of Mr. A. H. Stanley, general manager of the Metropolitan District Railway Co., in opposition to the Bill, Mr. S. Sellon, and Dr. H. F. Parshall, chairman of the Central London Railway, the Committee decided that the part of the preamble of the Bill relative to the running to Ealing was not proved.

Later, the Committee proceeded to consider the remainder of the Bill which sought to empower the company to make an extension from Rickmansworth to Watford, at a cost of £108,436. This portion of the Bill was opposed by the London and North-Western Railway Co. who are contemplating, by their Bill before Parliament this year, a great extension of the service to Watford, following on the electrification of parts of the system. The Committee found the preamble of this part of the Bill proved.

Electric Lighting Provisional Order (No. 1) Bill.—This Bill, which has been committed for second reading, contains confirmation of Board of Trade Orders relating to the following places:—Ardsley.—Order granted to the Electrical Distribution of Yorkshire, Ltd. Bingley.—Order granted to the U.D.C. Birstall.—Order granted to the U.D.C., with power to transfer within one year to the Electrical Distribution of Yorkshire, Ltd. Bognor.—Order granted to W. Tate, of Tower House, Felpham, but such powers are not to be authorised unless transferred to a company. Burnham.—Order to the U.D.C., but powers not to be authorised unless transferred to a company to be called the Burnham and District Electric Supply Co. Great Harwood.—Order to the U.D.C. Greetland.—Order to the U.D.C. Hoyland Nether.—Order to the U.D.C., with power to transfer to the Electrical Distribution of Yorkshire, Ltd. Launceston.—Order to the Launceston and District Electric Supply Co. Wimborne and District.—Order to the Bournemouth and Poole Electricity Co., Ltd.

Tarbert Harbour.—The Pier and Harbour Provisional Order Bill which passed the Examiners on Monday contains clauses to enable the trustees to, amongst other things, lay down electric mains, to provide tramways, and to provide motive power for tramways.

Electric Lighting Provisional Order (No. 2) Bill.—On Monday the above Bill passed the Examiner. It confirms Board of Trade Orders in regard to the following: Abercarn—Order granted to the U.D.C., but not to be exercised unless tranferred to the South Wales Electrical Power Co. Aylesbury—Order to the U.D.C. Biddulph—Order to the U.D.C. Burnley—Order to the Corporation for extension to adjoining parishes. Darton and District—Order to Electrical Distribution of Yorkshire. Doncaster—Order to the Corporation to extend area to include Wheatley. Dorchester—Order granted to J. & W. Purves to be transferred to a company to be called the County of Dorset Electric Supply Co., Ltd. Ilkley—Order to the U.D.C. Pontefract—Order to the Corporation to be transferred to the Yorkshire (West Riding) Electrical Tramways Co., Ltd. Sherborne—Order granted to J. & W. Purves to be transferred to the County of Dorset Electrical Supply Co., Ltd.

Second Readings.—In the House of Lords, on April 25th, the Metropolitan Railway Bill, Edgware and Hampstead Railway Bill, London Electric Railway Bill, and the Ramsbottom Urban District Railless Traction Bill, were read a second time.

Electricity in Westphalian Collieries.—It is known that the use of electricity in German collieries has increasingly progressed during the past 10 years, but no statistics on the subject were available until recently. These have been published by Dr. Jungst, in reference to the coal mines in the Ruhr. It appears that the production at the mines amounted to 461,600,000 KW.-hours in 1910, the source of power being coke-oven gases used in the working of large gas engines, or in the firing of steam boilers. In 1906 the output of electric power at the coal mines in the Ruhr was only 58,000,000 KW.-hours; in 1907 it advanced to 107 millions; in 1908 to 171 millions; in 1909 to 256 millions; and in 1910, as already mentioned, to 461·6 millions of KW.-hours. The largest producers bear such well-known names as the Gelsenkirchen Mining Co., with 58·7 millions in 1910; the Hibernia Mining Co. with 43·9 millions, the Harpen Co. with 41 millions, and the Gutehoffnungshutte with 22 millions of KW.-hours. Out of the total production in 1910 the largest proportion (402 KW.-hours) was utilised for the private purposes of the collieries concerned, and 38 millions were used in connection with other plants owned by the producing companies, whilst the balance of nearly 22 millions was disposed of to third parties in 1910, as compared with only 83,000 KW.-hours in 1906. In addition to the collieries, the iron and steel works in Rhenish-Westphalia are also large producers and consumers of electric power, which is principally obtained by the use of blast furnace gases, although they have not made such progress in this direction as the purely coal mining undertakings themselves. In 1906 the iron and steel works had an output of 45·7 millions, but the quantity had only risen to 106 millions of KW.-hours in 1910, although the latter does not include the production of the works of the Deutscher Kaiser Corporation, concerning which no particulars are obtainable. About two-thirds (69 millions) of the output of the iron and steel works were consumed by the works themselves, 32 millions were employed in their own collieries, and the balance of five millions was sold to other undertakings.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

ROUMANIA.—With reference to the recent note regarding a Bill for the modification of the Roumanian Tariff, the Board of Trade are informed that the Bill has now been passed, and in addition to the alterations already notified the following reductions have been made :—

	Former rate. Lei per 100 kg.	New rate. Lei per 100 kg.
Iron or steel wire—		
1·5 mm. in diameter or more ...	8	6
From 1·5 mm. to ·5 mm. in diam.	15	9
Less than ·5 mm. in diam. ...	18	13

25 Lei = £1. Kilog. = 2·204 lb.

BRAZIL.—With reference to the notice which appeared in a recent issue of the ELECTRICAL REVIEW regarding the proposed modification of the Consular invoice regulations for goods shipped to Brazil, the Board of Trade have received a telegram from H.M. Minister at Rio de Janeiro, reporting that he has been officially informed that the regulations in question will not be enforced pending the decision of Congress with regard thereto.

CHILE.—The Chilian Government effected certain alterations in the tariff which were to come into force on April 15th of this year. The information as to duties leviable on electrical goods in Chile previously published in the ELECTRICAL REVIEW will therefore require to be modified in accordance with the following amendments :—

An additional duty of 5 per cent. *ad valorem* is to be levied on articles which now pay 5, 15, 25, 35 or 60 per cent. *ad valorem* ; and a surcharge of 10 per cent. is to be imposed on the specific duties levied under Article 6 of the Tariff Law of December 23rd, 1897, except on sugar and on wheat flour ; this additional duty and surtax are to remain in force for three years. A duty of 5 per cent. *ad valorem* is to be levied *permanently* on goods which are now duty free under Article 7 of the Tariff Law, with certain exceptions.

PORTUGAL.—A Bill has recently been introduced into the Portuguese Legislature by the Minister of Finance providing that the duties prescribed by the Portuguese Customs Tariff shall be levied in gold in one of the following forms :

(*a*) Portuguese gold coins at their face value ;
(*b*) Sovereigns, and gold coins of the Latin Union, at their par value ;
(*c*) Duly guaranteed cheques on London, Paris, Brussels, Berlin, and Amsterdam, in pounds sterling, francs, marks, and florins, respectively, at their par value ;
(*d*) "Gold warrants," *i.e.*, special bonds intended exclusively for the payment of Custom duty issued by the Bank of Portugal or by other banks and bankers authorised by the Government. These "warrants," made out for the amount of duty for which each consignment of imported merchandise is liable, will be sold at such a premium as circumstances and competition may dictate.

For consignments cleared through Customs offices of the Continent or adjacent Islands, or through urban sub-offices, on which the amount of duty does not exceed 4,500 reis (about £1), and for consignments cleared through other Customs sub-offices on which the amount of duty does not exceed 18,500 reis (about £4), payment may be made in national currency, the duty in these cases being increased by an amount corresponding to the average premium on gold, as determined by the Government each week.

EXPIRING PATENTS.

(*Continued from page 700.*)

9,802. April 28th, 1898. "Driving printing, &c., machines by electromotors." W. A. CLATWORTHY, W. H. HOLMES, A. HOLMES, J. H. HOLMES, L. W. HOLMES and E. HOLMES, trading as J. H. Holmes & Co. Relates to a method of, and means for, driving printing and other machines at variable speeds by electric motors. The machine is driven direct by a large motor at high speed when printing, and is driven slowly, as when making ready, &c., by a small motor geared to the driving shaft by worm and screw gears and a clutch. When the switch is operated the circuit through the small series-wound motor and the solenoid is closed. The latter operates to engage the clutch through which the small motor drives the machine. Further movement of the bridge pieces closes the main switch ; later it closes the circuit through the armature of the large shunt-wound motor. When the speed of the large motor becomes greater than that of the small motor, the clutch over-runs and the cone of the solenoid is operated by it to connect the two contacts, closing a circuit which short-circuits the magnet. This releases the switch and throws out the small motor.

10,291. May 5th, 1898. "Relates to Rheostats." C. WIRT. A continuous metal ribbon is wound or folded into a number of connected sections. These may be made by winding them on a circular or elliptical mandrel, and afterwards pressing them flat. The layers in each section are separated by applying an insulating cement to the ribbon as it is wound, or by oxidising the surface of the ribbon, or otherwise. The connected sections are arranged circularly on mica or asbestos insulation in a ribbed case. Each section is covered by a metal sector, and the sectors are held down by insulating material below a covering ring.

11,158. May 16th, 1898. "Electric railways, &c." H. H. LEIGH. (F. J. Sprague.) Relates to methods of controlling electrically-driven trains from any desired point on the train, which may be built up of vehicles, arranged in any order and any or all of them carrying one or more driving motors or none at all. In the simplest form, two wires run the length of the train and have connected to them in parallel all the driver's controllers so that current can be sent from the main supply to either of two solenoids, whereby the circuits to the motors are made for forward or backward running. Instead of the simple make-and-break switches actuated by these solenoids, resistance switches may be used.

11,158A. May 16th, 1898. "Electric couplings." H. H. LEIGH. (F. J. Sprague.) Relates to couplings for electrically-propelled vehicles which are equipped to form trains as described in Specification No. 11,158, A.D. 1898. The couplings are so arranged that the speed-controlling wires and direction-controlling wires may be properly connected even though the cars are reversed. Couplings of like constructions are secured at the end of each car, and connection is made by a detachable connecting piece. The speed-controlling wires are arranged vertically and the direction-controlling wires horizontally. The fixed part of the coupling is completely shrouded and carries the contact plugs on an insulating block. The flexible connecting piece is fitted with a socket piece at each end and with a key to fit in the keyway.

11,158B. May 16th, 1898. "Controlling electric motors." H. H. LEIGH (F. J. Sprague). Relates to apparatus for controlling motors used for traction purposes, such as are described in Specification No. 11,158, A.D. 1898. A number of vehicles are adapted to be coupled up as a train, and each vehicle has a controller operated by a pilot motor controlled by a master controller. The main switch is driven by the pilot motor through worm gearing and a flexible coupling, notched wheels serving to hold the switch in the proper position. The reversing switch is operated when one of a pair of cores is drawn within the corresponding coil. The cores fit closely to the tube of the coil, so as to form a dash-pot arrangement, and blow-out magnets are fitted around the contacts to minimise arcing. In modified arrangements the reversing, the resistance and the series multiple switches are separately controlled, and additional switches are provided for cutting out the pilot motor when the main switch is in its limiting positions.

12,325. June 1st, 1898. "Wireless telegraphy." G. MARCONI and WIRELESS TELEGRAPH AND SIGNAL Co. Relates to the class of apparatus described in specification No. 12,039, A.D. 1896. The receiving apparatus including the coherer with its trembler and choking coils, relay batteries and resistances, is enclosed in a metal case. The coherer and relay circuits are connected on one side to the metal case, which is put to earth by a wire. The other terminal of the coherer circuit is formed as a clip for engagement with a plug on the end of the flexible connection of the aerial conductor ; this plug can be connected as desired to the transmitter circuit. The relay is connected to the recording receiver by the case connection and by a wire which passes insulatingly through the case to a chamber containing a coil of insulated wire sheathed with tinfoil.

11,326. May 18th, 1898. "Cord winches." W. H. STURGE. An automatic cord reel applicable to taking up leads for electric lamps, consists of a loose bobbin through which the cord is passed, and which is connected to a supporting tube by a coiled spring. The tube is screwed into a projection in one half of a spherical case, and locked by a nut. Before the cord is applied the bobbin is turned on the tube to wind the spring sufficiently to support the weight that is to be supported, and the bobbin is then held temporarily by a screw engaging an arm of the tube until the cord has been passed through a hole in the bobbin.

11,627. May 23rd, 1898. "Electric conductors." W. S. SMITH. Electric conductors are formed of a central metallic core covered with one or more spirals of metallic tape. The tape employed is of the same metal as the core, a suitable adhesive being employed when necessary.

12,326. June 1st, 1898. "Wireless telegraphy." G. MARCONI and WIRELESS AND TELEGRAPH SIGNAL Co. Relates to improvements in that class of apparatus described in Specification No. 12,039, A.D. 1896. The coherer is connected to the secondary coil of a fine wire induction coil, the primary of which is connected between the aerial conductor and the earth or a capacity. A condenser is in series with the secondary and the coherer. The circuit of the local receiver is provided with choking coils, and forms a parallel circuit. Several forms of induction coil are described in which the primary is wound in parallel or series parallel sections, and the secondary is formed of one or more sections having decreasing numbers of turns in the several layers.

12,431. June 2nd, 1898. "Driving dynamos." E. J. PRESTON. The dynamo used for electric lighting railway vehicles is suspended at each end by a pair of links from the underframe of the carriage. The driving belt is maintained taut by the weight of the dynamo and the tension of the belt is regulated by means of an adjustable counterweight or an adjustable spring.

12,731. June 7th, 1898. "Electric telegraphs." A. MUIRHEAD. Cable circuits for submarine working are provided with inductance coils and condensers in series with the cable and artificial cable. The receiver may be of any type, and is shown with an adjustable inductance shunt. The transmitter is shunted by an inductance, both being connected to the arm of a balancing rheostat.

13,680. June 20th, 1898. "Secondary batteries." S. W. HART and E. J. CLARK. The plates are held together by insulating bolts which pass through retaining bars through holes in the plates and through holes in insulating washers placed between the plates and acting as separators. The lugs of the plates of one polarity are connected together by casting on them a bridge with a main central contact piece in which is a tapered hole and which is connected with a similar piece of another cell.

14,127. June 25th, 1898. "Heating : medical appliances." H. J. DOWSING. Relates to apparatus for utilising radiant heat or light for medical and other purposes. The incandescent electric lamps are supported partly by their connection to the ends of the chambers and partly by metal clips secured to angular reflectors. The chambers are of metal or other suitable material. Screens are provided between the radiating source and the space or part under treatment.

15,041. July 8th, 1898. "Electric cut-outs." BRITISH THOMSON-HOUSTON Co., LTD. (E. M. Hewlett). Relates to the moving arm of the cut-out which is connected to the resetting handle by a toggle arrangement controlled by an electromagnet and tripping mechanism. The handle is moved downwards to reset the apparatus. The fixed terminals are fitted with brushes and carbons. The armature is held up by a spring acting through a pivoted bar and handle. When it is pulled down, as by an excessive current, its end strikes the latch and liberates the pawl to release the cut-out.

(*To be continued.*)

Book Notices.—*Yellowsands.* By A. Gowans Whyte. London : William Blackwood & Sons. 1912. Price 6s.—The subtitle of this book is "A Holiday Tale" ; it is, in a sense, a tale of a holiday, and is certainly a suitable tale for a holiday, but the limitation was hardly necessary, for it is well worth reading at any time. The characters are portrayed with originality and vraisemblance, and the dialogues are never wearisome ; the plot holds the reader's attention to the end, and though the story ends rather in the air, one feels that there is nothing more to be said, and the author wisely says it. The tale has no connection with the electrical industries except the author ; the hero, in fact, is a vinegar manufacturer who, after years of absorption in his business, discovers a world of thought and emotion of whose existence he had been but dimly aware. He is sucked into a whirlpool of romance, and after a series of bewildering gyrations, is gently restored to his normal surroundings with a new outlook on life. We have read the story with pleasure and edification.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

8,843. "Electric bell alarm." R. H. Marsh. April 15th, 1912.

8,846. "Telephone systems and the registration of calls and messages therein." H. Hawthorn and H. Thomas. April 15th, 1912.

8,864. "Ceiling roses and like electrical fittings." T. Kearns. April 15th, 1912.

8,894. "Electric measuring instruments." E. A. Fagerlund. April 15th, 1912. (Complete.)

8,907. "Electric arc lights." General Composing Co., G.m.b.H. (Divided application on 15,474/11, July 3rd. Convention date, July 4th, 1910, Germany.) April 15th. (Complete.)

8,908. "Process for the better utilisation in therapeutics of the products of decomposition of radio-active elements." S. Saubermann. (Convention date, April 13th, 1911, Germany.) April 15th. (Complete.)

8,917. "Automatic photometric electrical variable resistance." J. W. Haggard. April 16th.

8,951. "Non-polar, unipolar, or homopolar dynamo." P. Hynes. April 16th.

8,986. "Apparatus for starting multiple cylinder internal-combustion motors by means of magnetos." Weckerlein and Stocker. (Convention date, October 11th, 1911, Germany.) April 16th. (Complete.)

8,989. "Apparatus for producing contacts at adjustable periodic intervals." Soc. A. Granoux & Co. (Convention date, October 10th, 1911, France.) April 16th. (Complete.)

8,997. "Telephone exchange system." M. L. Johnson. April 16th. (Complete.)

9,010. "Telephone metering systems and apparatus therefor." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 16th.

9,046. "Contacts for electric controllers or switches." G. P. Fairless and S. N. Warren. April 17th.

9,075. "Electro-deposition of metals." A. Leuchter. April 17th. (Complete.)

9,076. "Suspension devices for cables, trolley wires, and the like." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitats Ges. Germany.) April 17th.

9,134. "Speed regulation of alternating current induction motors." Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke G.m.b.H. Germany.) April 18th. (Complete.)

9,147. "Rotary annular multipolar magnetic separator." Maschinenbau Anstalt Humboldt. (Convention date, April 19th, 1911, Germany.) April 18th. (Complete.)

9,148. "Anode supports for use in electro-plating." Spirella Co. of Great Britain, Ltd. (Spirella Co., United States.) April 18th. (Complete.)

9,149. "Anode supports for use in electro-plating." Spirella Co. of Great Britain, Ltd. (Spirella Co., United States.) April 18th. (Complete.)

9,154. "Electrical winding gear for clocks and the like." L. J. Aron and C. Wiener. April 18th.

9,168. "Lamp arrangements for electric lighting." H. T. Harrison. April 18th.

9,178. "Submarine sound direction finders." L. I. Blake. April 18th. (Complete.)

9,179. "Telephony." S. G. Brown. April 18th.

9,181. "Method of setting or adjusting from a distance through the medium of periodic oscillations of different frequency." E. F. Huth G.m.b.H. (Convention date, April 18th, 1911, Germany.) March 18th. (Complete.)

9,208. "Electric resistance furnace." L. Uebelohde." April 18th. (Complete.)

9,210. "Alternating current motors." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 18th.

9,211. "Governing mechanism for centrifugal compressors." Warwick Machinery Co. (1908), Ltd. (General Electric Co., United States.) April 18th.

9,263. "Electric traps." S. Takacs. April 19th. (Complete.)

9,278. "Terminals for electric batteries." H. Lucas and G. H. Jackson. April 19th.

9,302. "Device for securing shades and the like on electric lampholders." W. J. Instan and A. Holt. April 19th.

9,309. "Electric cables." Western Electric Co., Ltd. (Western Electric Co., United States.) April 19th. (Complete.)

9,328. "Electric motors." A. Lehmann. April 19th.

9,338. "Device for disinfecting telephone mouthpieces and other similar instruments." S. B. Dewhirst. April 20th.

9,369. "Method of indicating to ships the presence of icebergs or other obstacles." W. Grimshaw. April 20th.

9,374. "Junction and test boxes bonding sleeves for electrical purposes." B. A. Pilkington. April 20th.

9,379. "Regenerative process for use in electro-zincing." F. E. Hampton. April 20th.

9,380. "Apparatus for electro-galvanising small articles." F. E. Hampton. Apil 20th.

9,382. "Automatic electric switch devices." Fried. Krupp Akt.-Ges. (Convention date, June 7th, 1911, Germany.) April 20th. (Complete.)

9,411. "Electric measuring instruments." C. Hubert. April 20th. (Complete.)

9,416. "System of electric generation and transmission for motor-driven vehicles, locomotives or trains." H. Leitner. April 20th.

9,422. "Telegraphy and telegraphic apparatus." J. S. Enright and Gresham Finance Corporation, Ltd. April 20th.

9,426. "Electrical distribution systems." J. Bijur. April 20th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

Electromagnetic Ore-Separators. R. Steinert and N. Stein. 1,619. January 21st.

Self-Regulating Dynamo-Electric Machines. A. H. Midgley and C. A. Vandervell. 2,158. January 27th.

Suspension of Electric Conductors. Allgemeine Elektricitäts Ges. 4,623. February 20th. (February 24th, 1910.)

Electric Motor Controllers. R. Edwards and E. S. Stait. 6,996. March 21st.

Devices for Suspending, Lowering and Hoisting Electric and other Lamps. Johnson & Phillips, Ltd. 7,092. March 21st.

Electric Meters and the like. R. B. Hill. 7,522. March 25th.

Telephone Exchange Systems. E. E. Clement. 7,611. March 27th.

Dynamo-Electric Machines for Generating High-Frequency Electric Currents. J. G. Balsillie. 7,749. March 28th.

Controlling Electric Motors. A. L. Holmes and D. C. Holmes. 7,785. March 29th.

Continuous Electric Switch. R. Johnson. 7,872. March 30th.

Type-Printing Electric Telegraphs. E. Belin. 9,556. April 19th.

Electric Lifts. H. Marryat. 10,348. May 4th.

Mine Exploders. Sterling Telephone and Electric Co. (Schaffler & Co., Austria) 12,145. May 19th.

Electric Signal Systems for Railways and the like. British Thomson-Houston Co. (General Electric Co.) 12,579. May 24th.

Pole-Shoes of Magneto-Electric Machines for Ignition Purposes in connection with Internal-Combustion Engines. Electric and Ordnance Accessories Co., J. R. Garner and N. Collins. 13,246. June 2nd.

Intercommunication Telephone Systems with Secrecy. H. E. R. Roose and W. Finlay. 13,601. June 7th.

Electric Horns and like Signalling Devices. S. Manson. 15,138. June 28th. (October 3rd, 1910.)

Galvanic Socks or Loose Soles for Boots and other Footwear. N. Pultinger. 15,279. June 30th.

Telephone Exchange Systems. W. Aitken and British Insulated and Helsby Cables, Ltd. 15,503. July 4th.

Telephones. B. Gwozdz. 18,235. August 11th. (June 2nd, 1911.) (Addition to No. 11,234 of 1911.)

Telephone Station. C. B. Redfern. (Telephon Automaten Ges.) 19,252. August 28th.

Common-Battery Telephone Systems. Aktiebolaget L. M. Ericsson & Co.) 21,924. October 4th. (October 7th, 1910.)

Appliance for Obtaining Static Electricity from either Positive or Negative Pole of the Secondary of an Induction Coil. G. C. Blake. 22,680. October 14th.

Electric Heating and Sterilising Apparatus. Soc. Electro-Industrielle et Anciens Etablissements Mathieu Reunis. 26,928. October 27th. (October 27th, 1910.)

Primary Cells with Depolariser. Z. Szpor. 26,842. November 30th.

Interrupting Devices for Internal-Combustion Engines. Firm of Robert Bosch. 26,929. December 1st. (November 7th, 1911.)

Electrically-Heated Thermal Accumulator. A. Rittershaussen. 27,843. December 11th.

Electrical Heating of Service or Dinner Lifts. Hodgson. 27,883. December 12th.

Dynamo-Electric Machines. A. H. Midgley and C. A. Vandervell. 15,088. June 27th.

Construction of Electric Plug Connection. A. A. Price. 16,081. July 11th.

Automatic Telephone Exchange Selector. F. R. McBerty. 16,867. July 22nd. (July 23rd, 1910.)

Purification of Asbestos. British Thomson-Houston Co. (General Electric Co.) 16,960. July 23rd.

Alternating-Current Commutator Generators. Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke Ges.) 17,040. July 23rd.

Holders or Carriers for Supporting Incandescent Electric Lamp-Shades and the like. R. Stafford and C. F. Barnes. 18,086. August 9th.

Starting Switches for Electric Motors. Siemens Bros. Dynamo Works, Ltd., and E. Schupp. 18,575. August 17th.

Trollies or Collectors for Electricity. J. Coan and S. Cook. 19,695. September 4th.

Process for the Manufacture of Electric Metal-Filament Lamps. K. Schwab. 20,224. September 12th. (May 4th, 1911.)

Safety Device for Electric Cables. Siemens-Schuckertwerke Ges. 20,995. September 14th. (May 2nd, 1911.)

Annunciators for Hotels and the like. W. P. Thompson. (Akt.-Ges. Mix und Genest Telephon und Telegraphen Werke.) 22,948. October 3rd.

Electric Contact-Making and Cut-Out Devices for Electrically Lighting Motor-Cars and other Vehicles and Rolling Stock. J. Polkey. 24,481. November 3rd.

Electric Reading Lamps. R. E. Burnham. 25,211. November 13th.

Electrodes for Arc Lamps. H. Beck. 25,916. November 20th.

Method and Apparatus for the Electric Transmission of Pictures. L. Tschörner. 27,474. December 7th. (February 11th, 1911.)

Apparatus for Lifting the Brushes and Short-Circuiting the Rotor Windings of Alternating-Current Dynamo-Electric Machines. Bruce Peebles & Co. (incorporated 1908) and F. G. Brookhouse. 28,682. December 20th.

Control Systems for Electric Motors for Driving Reversing Mechanisms as Applied to Machine Tools. Vickers, Ltd., and B. E. Ellison. 7,883. March 29th.

Electromagnetic Step-by-Step Mechanism for Electric Clocks and other purposes. G. B. Bowell & Bowell. 8,039. March 30th.

Electric Motor-Controlled Regulating Devices for Furnace-Dampers, Valves and the like. O. Rennert. 8,151. March 31st. (April 1st, 1910.)

Wireless Telegraphy. R. Bull, O. Arnesen and B. Sixer. 8,236. April 1st.

Magneto-Electric Machine. L. Lindos. 8,340. April 3rd.

Means for Magnifying Small Mechanical or Electrical Effects. E. S. Heurtley. 8,397. April 4th.

Remote Control Systems for Electrically-Driven Vehicles. Elektromotoren Werke Hermann. 10,551. May 1st. (September 22nd, 1910. Addition to No. 10,550 of 1911.)

Electric Furnaces. Plauson, N. Zsvetaeff and T. Tistchenko. 10,858. May 4th.

Means for Attaching Arms to Telegraph and other such Poles, and in the Manufacture thereof. H. Lench. 10,917. May 5th. (Cognate application, No. 12,528 of 1911.)

Means for Attaching Lamp-Shades or the like to Electric Lampholders. J. G. Berry. 12,784. May 29th.

Electrical Current-Controlling Device. A. E. Berdon. 15,149. June 28th. (July 5th, 1910.)

Electric Furnaces. British Thomson-Houston Co. (General Electric Co.) 17,060. July 25th.

Magneto-Electric Machines. N. Flint. 18,702. August 19th.

Electrical Controllers. Bray, Markham & Reiss, Ltd., F. N. Bray, F. R. Markham and F. E. Reiss. 19,365. August 30th.

Electrical Alarm Apparatus for Cash-Boxes, Jewel-Boxes and like Receptacles. G. Downing and P. S. Moulton. 25,446. November 15th.

Electric Arc Lamps. W. Rogers and G. Rowe. 26,511. November 27th.

Apparatus Adapted for Use with an Alternating Current for Signalling to a Distance. Hartmann & Braun Akt.-Ges. 26,548. November 27th. (December 21st, 1910.)

1912.

Switching Apparatus for Telephone Exchange Systems. E. E. Clement. 3,947. February 10th. (Divided application on No. 7,611 of 1911. March 27th.)